PB81-162505

Flue Gas Desulfurization Information System (FGDIS) Data Base User's Manual

PEDCo-Environmental, Inc.
Cincinnati, OH

Prepared for

Industrial Environmental Research Lab.
Research Triangle Park, NC

Mar 81

U.S. Department of Commerce
National Technical Information Service
NTIS

PB81-162505

PEDCo ENVIRONMENTAL

PRODUCT OF:
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

FLUE GAS DESULFURIZATION
INFORMATION SYSTEM
DATA BASE USER'S MANUAL

Prepared by

PEDCo Environmental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246

March 1981

CONTENTS

Page

1. General Information 1

2. Data Base Structure 3

2.1 Structure diagram 3
2.2 Field listing (DESCRIBE output) 4

3. Data Base Execution 27

3.1 NCC access 27
3.1.1 Computer log-on 28
3.1.2 Computer log-off 42
3.2 SYSTEM 2000 execution/termination 42
3.3 Immediate Access features 43
3.3.1 DESCRIBE command 44
3.3.2 TALLY command 45
3.3.3 PRINT command 47
3.3.4 Format statements 51
3.3.5 System functions 54
3.3.6 In-line functions 56
3.3.7 Ordering statements 58
3.3.8 LIST command 59
3.3.9 BY clause 67
3.3.10 WHERE clause 73
3.3.11 Unary operators: EXISTS, FAILS 79
3.3.12 Binary operators: EQ, NE, LT, GT, GE, LE 80
3.3.13 Ternary operators: EQ, NE, SPANS 80
3.3.14 Boolean operators: AND, OR, NOT 82
3.3.15 HAS operator 84
3.3.16 DITTO operator 88
3.3.17 SAME operator 89
3.4 Report Writer feature 90

4. Output Control 93

4.1 NCC bin assignments 93
4.2 Directing output to NCC bins for mailing 93

Appendix A

Report Writer programs A-1

Appendix B

Tymnet diagnostic messages B-1

Appendix C

SYSTEM 2000 diagnostic messages C-1

NOTICE

THIS DOCUMENT HAS BEEN REPRODUCED FROM THE BEST COPY FURNISHED US BY THE SPONSORING AGENCY. ALTHOUGH IT IS RECOGNIZED THAT CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED IN THE INTEREST OF MAKING AVAILABLE AS MUCH INFORMATION AS POSSIBLE.

PB81-162505

50272-101

REPORT DOCUMENTATION PAGE

1. REPORT NO.

2.

3. Recipient's Accession No.

4. Title and Subtitle
Flue Gas Desulfurization Information System (FGDIS)
Data Base User's Manual

5. Report Date
March 1981

6.

7. Author(s)
M. Smith

8. Performing Organization Rept. No.
PN 3560-2-6

9. Performing Organization Name and Address
PEDCo Environmental, Inc.
11499 Chester Road
Cincinnati, OH 45246

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
EPA, Office of Environmental Engineering Technology
Industrial Environmental Research Laboratory
Research Triangle Park, NC 27711

13. Type of Report & Period Covered

14.

15. Supplementary Notes
Other pertinent manuals are the System 2000® Reference Manual and NCC User Reference Manual.

16. Abstract (Limit: 200 words)

This manual is intended to provide a guide to the use of the Flue Gas Desulfurization Information System (FGDIS) data base which is a collection of data files consisting of information pertaining to the design and performance of flue gas desulfurization (FGD) systems. The files are stored at the U.S. Environmental Protection Agency National Computer Center (NCC), Research Triangle Park, NC. Access to these files and manipulation of the data therein is accomplished via System 2000®, a general data base management system developed by INTEL Corp. and supported by the NCC Univac 1100 hardware.

17. Document Analysis a. Descriptors

Pollution, Flue Gases, Desulfurization, Electric Utilities, Waste Disposals, Boilers, Maintenance, Data Base

b. Identifiers/Open-Ended Terms

Pollution Control, Stationary Sources, Utility Boilers

c. COSATI Field/Group

18. Availability Statement:
Unlimited

19. Security Class (This Report)
Unclassified

20. Security Class (This Page)
Unclassified

21. No. of Pages

22. Price

(See ANSI-Z39.18) See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

1.0 GENERAL INFORMATION

This manual is intended to provide a guide to the use of the Flue Gas Desulfurization Information System (FGDIS), a collection of data base files stored at the National Computer Center (NCC) (Research Triangle Park, North Carolina). Access to these files and manipulation of the data therein is accomplished via SYSTEM 2000, a general data base management system developed by INTEL Corporation and supported by the NCC Univac 1100 hardware. Other user's manuals relevant to use of this system are as follows:

- SYSTEM 2000® Reference Manual - this manual (available through INTEL Corporation, Austin, Texas) provides in depth information on the use of SYSTEM 2000. Certain sections of this manual concerned with the Immediate Access and Report Writer features of SYSTEM 2000 have been reproduced from this manual, courtesy of INTEL.
- NCC User Reference Manual - this manual was prepared for the U.S. Environmental Protection Agency by SDC Integrated Services, Inc. and provides in depth descriptions of the Univac 1100 Executive Control Language.

Throughout this manual, the following documentation symbols will be used:

< >	The enclosed item is a user-supplied value.
[ ]	The enclosed item is mandatory. When a choice of values is shown, the user must specify one of them.
{ }	The enclosed item is optional and has a default setting if no user specification is made.
Δ	Designates a blank.

These symbols do not appear in actual commands or output. They are documentation conventions only.

2.0 DATA BASE STRUCTURE

2.1 STRUCTURE DIAGRAM

The Flue Gas Desulfurization Information System (FGDIS) data base is a collection of data files consisting of information pertaining to the design and performance of flue gas desulfurization (FGD) systems. The data is stored in the form of logical entries (elements) linked together by a common structure that consists of various levels of repeating groups (or levels of information). Figure 1 is an illustration of this structure, which presents the various repeating groups of the FGDIS and the hierarchy associated with them, as well as some of the key data items that are included in each group. Level zero is at the top and consists of a single repeating group containing general plant information. Immediately below level zero is level one, consisting of six groups, followed by level two, and so on. Associated with each repeating group is a group number (not included in Figure 1), with the exception of the level zero group. Elements that reside at level zero are said to be in an assumed repeating group called "ENTRY".

A data tree is defined as any repeating group at a given level plus all its direct descendant repeating groups. Referring to Figure 1, an example of a data tree would be the tree beginning

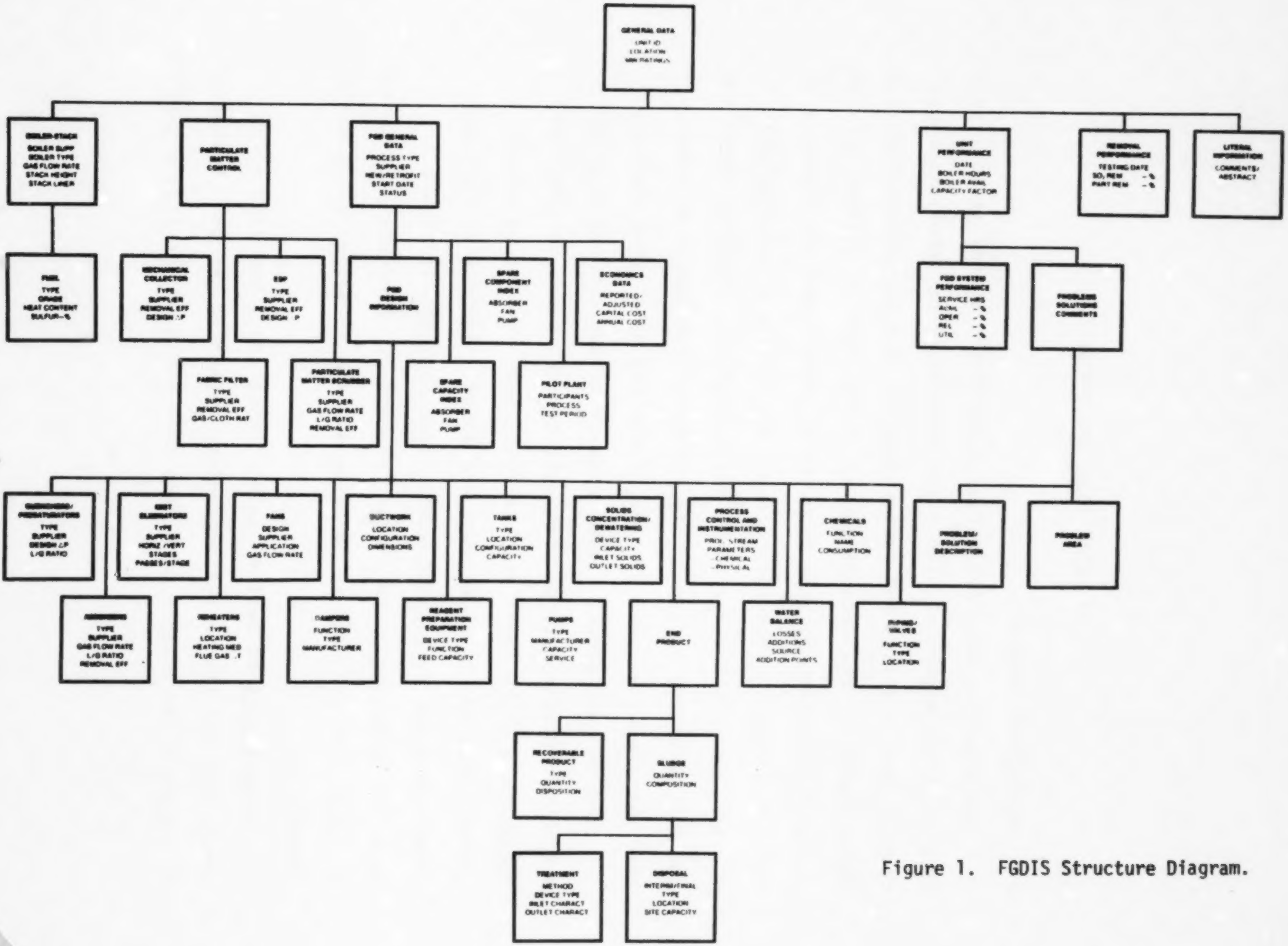

GENERAL DATA
UNIT ID
LOCATION
MW RATINGS
BOILER-STACK
BOILER SUPP
BOILER TYPE
GAS FLOW RATE
STACK HEIGHT
STACK LINER
FUEL
TYPE
GRADE
HEAT CONTENT
SULFUR—%
PARTICULATE MATTER CONTROL
MECHANICAL COLLECTOR
TYPE
SUPPLIER
REMOVAL EFF
DESIGN ΔP
ESP
TYPE
SUPPLIER
REMOVAL EFF
DESIGN ΔP
FABRIC FILTER
TYPE
SUPPLIER
REMOVAL EFF
GAS/CLOTH RAT
PARTICULATE MATTER SCRUBBER
TYPE
SUPPLIER
GAS FLOW RATE
L/G RATIO
REMOVAL EFF
FGD GENERAL DATA
PROCESS TYPE
SUPPLIER
NEW/RETROFIT
START DATE
STATUS
FGD DESIGN INFORMATION
SPARE COMPONENT INDEX
ABSORBER
FAN
PUMP
ECONOMICS DATA
REPORTED/ ADJUSTED
CAPITAL COST
ANNUAL COST
SPARE CAPACITY INDEX
ABSORBER
FAN
PUMP
PILOT PLANT
PARTICIPANTS
PROCESS
TEST PERIOD
UNIT PERFORMANCE
DATE
BOILER HOURS
BOILER AVAIL
CAPACITY FACTOR
REMOVAL PERFORMANCE
TESTING DATE
SO2 REM — %
PART REM — %
LITERAL INFORMATION
COMMENTS/ ABSTRACT
FGD SYSTEM PERFORMANCE
SERVICE HRS
AVAIL — %
OPER — %
REL — %
UTIL — %
PROBLEMS SOLUTIONS COMMENTS
PROBLEM/ SOLUTION DESCRIPTION
PROBLEM AREA
QUENCHERS/ PRESATURATORS
TYPE
SUPPLIER
DESIGN ΔP
L/G RATIO
MIST ELIMINATORS
TYPE
SUPPLIER
HORIZ /VERT
STAGES
PASSES/STAGE
FANS
DESIGN
SUPPLIER
APPLICATION
GAS FLOW RATE
DUCTWORK
LOCATION
CONFIGURATION
DIMENSIONS
TANKS
TYPE
LOCATION
CONFIGURATION
CAPACITY
SOLIDS CONCENTRATION/ DEWATERING
DEVICE TYPE
CAPACITY
INLET SOLIDS
OUTLET SOLIDS
PROCESS CONTROL AND INSTRUMENTATION
PROC. STREAM PARAMETERS
- CHEMICAL
- PHYSICAL
CHEMICALS
FUNCTION
NAME
CONSUMPTION
ABSORBERS
TYPE
SUPPLIER
GAS FLOW RATE
L/G RATIO
REMOVAL EFF
REHEATERS
TYPE
LOCATION
HEATING MED
FLUE GAS ΔT
DAMPERS
FUNCTION
TYPE
MANUFACTURER
REAGENT PREPARATION EQUIPMENT
DEVICE TYPE
FUNCTION
FEED CAPACITY
PUMPS
TYPE
MANUFACTURER
CAPACITY
SERVICE
END PRODUCT
WATER BALANCE
LOSSES
ADDITIONS
SOURCE
ADDITION POINTS
PIPING/ VALVES
FUNCTION
TYPE
LOCATION
RECOVERABLE PRODUCT
TYPE
QUANTITY
DISPOSITION
SLUDGE
QUANTITY
COMPOSITION
TREATMENT
METHOD
DEVICE TYPE
INLET CHARACT
OUTLET CHARACT
DISPOSAL
INTERIM/FINAL
TYPE
LOCATION
SITE CAPACITY

Figure 1. FGDIS Structure Diagram.

with the Boiler-Stack group and ending with the Fuel group. In this instance, the Fuel group is a direct descendant of the Boiler-Stack group.

2.2 FIELD LISTING (DESCRIBE OUPUT)

Within each repeating group of the data base is a series or elements (or components), some of which are indicated in Figure 1. Each element represents a piece of data stored within that group that is consistent with the repeating group designation. Each element consists of three major components:

Element Number * Element Name (Element Designation)

Each element has a unique Element Number associated with it that is used for identification purposes. The Element Number is followed by the system separator (*), which separates the Element Number from the Element Name. The Element Name identifies the piece of data that is stored (or can be stored) within the element. In the case of repeating groups, the Element Name is the name assigned to the respective group. The Element Designation contains a Data Type Designation, a Picture Designation and a Repeating Group Relationship. The Data Type Designation specifies whether the element is a DECIMAL field, INTEGER field, NAME field, or TEXT field. DECIMAL, INTEGER, and TEXT fields are self-explanatory. A NAME field consists of any alphanumeric data with all leading, trailing, and extraneous (more than one) embedded blanks discarded when the piece of data is stored. The Picture Designation is the field size specification for the information that is stored within the element. The notational conventions used are as follows:

X = symbol for an alphanumeric character for NAME and TEXT data types

9 = symbol for a numeric character for INTEGER and DECIMAL data types

XX or 99 = symbol for two characters

X(n) or 9(n) = symbol for the number of characters specified by (n)

Following the Picture Designation is the Repeating Group Relationship that specifies which repeating group the element is a member of.

Table 1 presents the complete FGDIS definition, inclusive of all repeating groups and the elements therein. This definition was produced using the DESCRIBE command (Section 3.3.1).

TABLE 1. FGDIS FIELD LISTING

```
   1*  IDENTIFICATION NUMBER (INTEGER NUMBER 999)
   2*  FOREIGN - DOMESTIC (NAME X(8))
   3*  UTILITY - INDUSTRIAL (NAME X(8))
   4*  SO2 & PARTICLE/PARTICLE (NAME X(8))
   5*  COMPANY NAME (NAME X(8))
   6*  ASSOCIATED UTILITIES (NAME X(8))
   7*  PLANT NAME (NAME X(8))
   8*  UNIT NUMBER (NAME X(8))
   9*  PLANT ADDRESS (NAME X(8))
  10*  PLANT CITY (NAME X(8))
  11*  PLANT COUNTY (NAME X(8))
  12*  PLANT STATE/COUNTRY (NAME X(8))
  13*  PLANT ZIPCODE (INTEGER NUMBER 9(5))
  14*  PLANT EPA REGION (INTEGER NUMBER 99)
  15*  PLANT RIVER BASIN (NAME X(8))
  16*  REGULATORY CLASSIFICATION - A/B/C/D/E/F/G (NAME X(8))
  17*  PARTICLE EMISSION LIMITATION - LB/MM BTU (DECIMAL NUMBER 99.99
       9)
  18*  SO2 EMISSION LIMITATION - LB/MM BTU (DECIMAL NUMBER 99.999)
  19*  NOX EMISSION LIMITATION - LB/MM BTU (DECIMAL NUMBER 9.999)
  20*  NET PLANT GENERATING CAPACITY - MW (INTEGER NUMBER 9999)
  21*  GROSS UNIT GENERATING CAPACITY - MW (INTEGER NUMBER 9999)
  22*  NET UNIT GENERATING CAPACITY WITH FGD - MW (INTEGER NUMBER 999
       9)
  23*  NET UNIT GENERATING CAPACITY W/O FGD - MW (INTEGER NUMBER 9999
       )
  24*  EQUIVALENT SCRUBBED CAPACITY - MW (INTEGER NUMBER 9999)
 100*  UNIT DATA - BOILER & STACK (RG)
  101*  BOILER SUPPLIER (NAME X(8) IN 100)
  102*  BOILER TYPE - PULVERIZED COAL/ETC (NAME X(8) IN 100)
  103*  BOILER FIRING METHOD - TANGENTIAL/ETC (NAME X(8) IN 100)
  104*  BOILER - WET BOTTOM/DRY BOTTOM (NAME X(8) IN 100)
  105*  BOILER DRAFT - FORCED/INDUCED/BALANCED (NAME X(8) IN 100)
  106*  BOILER SERVICE LOAD - BASE/PEAK/ETC (NAME X(8) IN 100)
  107*  BOILER COMMERCIAL SERVICE DATE - YYMM (INTEGER NUMBER 9999 I
        N 100)
  108*  DESIGN BOILER FLUE GAS FLOW - ACFM (INTEGER NUMBER 9(7) IN 1
        00)
  109*  BOILER FLUE GAS TEMPERATURE - F (INTEGER NUMBER 9999 IN 100)

  110*  BOILER DESIGN FUEL FIRING RATE - TPH (INTEGER NUMBER 999 IN
        100)
  111*  STACK HEIGHT - FT (INTEGER NUMBER 9999 IN 100)
  112*  STACK SHELL (NAME X(8) IN 100)
  113*  STACK FLUE CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(8) IN
        100)
  114*  STACK FLUE LINER CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(
        8) IN 100)
```

(continued)

```
  115*  STACK TOP INNER DIAMETER - FT (DECIMAL NUMBER 999.9 IN 100)
  116*  STACK GAS INLET TEMPERATURE - F (INTEGER NUMBER 999 IN 100)
  117*  STACK GAS OUTLET VELOCITY - ACTUAL FPS (DECIMAL NUMBER 999.9
        9 IN 100)
  118*  BOILER EXCESS AIR - % (DECIMAL NUMBER 999.9 IN 100)
  119*  STACK FLUE GAS OXYGEN - % (DECIMAL NUMBER 999.9 IN 100)
  120*  BOILER AVERAGE CAPACITY FACTOR - % (DECIMAL NUMBER 999.9 IN
        100)
  121*  BOILER HEAT RATE - BTU/KWH (INTEGER NUMBER 9(5) IN 100)
  122*  STACK FLUE CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(8) IN
        100)
  123*  STACK FLUE CONSTRUCTION MATERIAL COMMON NAME (NAME X(8) IN 1
        00)
  124*  STACK FLUE LINER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X
        (8) IN 100)
  125*  STACK FLUE LINER CONSTRUCTION MATERIAL COMMON NAME (NAME X(8
        ) IN 100)
  200*  ACTUAL FUEL DATA (RG IN 100)
    201*  FUEL TYPE (NAME X(8) IN 200)
    202*  FUEL GRADE - BITUMINOUS/SUBBITUMINOUS/ETC (NAME X(8) IN 20
          0)
    203*  NAME OF FUEL SUPPLIER (NAME X(8) IN 200)
    204*  MINE NAME/AREA (NAME X(8) IN 200)
    205*  MINE STATE (NAME X(8) IN 200)
    206*  MINE COUNTY (NAME X(8) IN 200)
    207*  AVERAGE HEAT CONTENT - BTU/LB (INTEGER NUMBER 9(6) IN 200)

    208*  RANGE HEAT CONTENT - BTU/LB (NAME X(8) IN 200)
    209*  AVERAGE ASH CONTENT - % (DECIMAL NUMBER 99.99 IN 200)
    210*  RANGE ASH CONTENT - % (NAME X(8) IN 200)
    211*  AVERAGE MOISTURE CONTENT - % (DECIMAL NUMBER 99.99 IN 200)

    212*  RANGE MOISTURE CONTENT - % (NAME X(8) IN 200)
    213*  AVERAGE SULFUR CONTENT - % (DECIMAL NUMBER 99.99 IN 200)
    214*  RANGE SULFUR CONTENT - % (NAME X(8) IN 200)
    215*  AVERAGE CHLORIDE CONTENT - % (DECIMAL NUMBER 99.99 IN 200)

    216*  RANGE CHLORIDE CONTENT - % (NAME X(8) IN 200)
    217*  FUEL ANALYSIS METHOD - AVERAGE/SPOT/TYPICAL (NAME X(8) IN
          200)
    218*  FUEL ANALYSIS DATE - YYMM (INTEGER NUMBER 9999 IN 200)
300*  PARTICLE CONTROL (RG)
  301*  PARTICLE CONTROL CONFIGURATION - INTEGRATED/SEGREGATED (NAME
        X(8) IN 300)
  302*  PARTICLE CONTROL SPACE REQUIREMENTS - SQ FT (INTEGER NUMBER
        9(7) IN 300)
  400*  MECHANICAL COLLECTOR (RG IN 300)
    401*  NUMBER OF MECHANICAL COLLECTORS (INTEGER NUMBER 99 IN 400)

    402*  MECHANICAL COLLECTOR NUMBER OF SPARES (INTEGER NUMBER 99 I
          N 400)
```

(continued)

```
    403*  MECHANICAL COLLECTOR PLACED IN SERVICE - YYMM (INTEGER NUM
          BER 9999 IN 400)
    404*  MECHANICAL COLLECTOR REMOVED FROM SERVICE - YYMM (INTEGER
          NUMBER 9999 IN 400)
    405*  MECHANICAL COLLECTOR TYPE (NAME X(8) IN 400)
    406*  MECHANICAL COLLECTOR SUPPLIER (NAME X(8) IN 400)
    407*  MECHANICAL COLLECTOR INLET FLUE GAS CAPACITY - ACFM (INTEG
          ER NUMBER 9(9) IN 400)
    408*  MECHANICAL COLLECTOR INLET FLUE GAS TEMPERATURE - F (INTEG
          ER NUMBER 9(5) IN 400)
    409*  MECHANICAL COLLECTOR PRESSURE DROP - IN H2O (DECIMAL NUMBE
          R 99.99 IN 400)
    410*  MECHANICAL COLLECTOR PART OUTLET LOAD - GR/SCF (DECIMAL NU
          MBER 999.99 IN 400)
    411*  MECHANICAL COLLECTOR PART REMOVAL EFFICIENCY - % (DECIMAL
          NUMBER 999.99 IN 400)
  500*  FABRIC FILTER (RG IN 300)
    501*  NUMBER OF FABRIC FILTERS (INTEGER NUMBER 99 IN 500)
    502*  FABRIC FILTER PLACED IN SERVICE - YYMM (INTEGER NUMBER 999
          9 IN 500)
    503*  FABRIC FILTER REMOVED FROM SERVICE - YYMM (INTEGER NUMBER
          9999 IN 500)
    504*  FABRIC FILTER TYPE - PULSE JET/REVERSE AIR/SHAKE (NAME X(8
          ) IN 500)
    505*  FABRIC FILTER SUPPLIER (NAME X(8) IN 500)
    506*  FABRIC FILTER NUMBER OF COMPARTMENTS (INTEGER NUMBER 9999
          IN 500)
    507*  FABRIC FILTER NUMBER OF SPARE COMPARTMENTS (INTEGER NUMBER
           999 IN 500)
    508*  FABRIC FILTER INLET FLUE GAS CAPACITY - ACFM (INTEGER NUMB
          ER 9(9) IN 500)
    509*  FABRIC FILTER INLET FLUE GAS TEMPERATURE - F (INTEGER NUMB
          ER 9(5) IN 500)
    510*  FABRIC FILTER PRESSURE DROP - IN H2O (DECIMAL NUMBER 99.99
           IN 500)
    511*  FABRIC FILTER PART OUTLET LOAD - GR/SCF (DECIMAL NUMBER 99
          9.99 IN 500)
    512*  FABRIC FILTER PART REMOVAL EFFICIENCY - % (DECIMAL NUMBER
          999.9 IN 500)
    513*  FABRIC FILTER TYPICAL GAS/CLOTH RATIO - FT/MIN (DECIMAL NU
          MBER 9.99 IN 500)
    514*  FABRIC FILTER MAX GAS/CLOTH RATIO - FT/MIN (DECIMAL NUMBER
           99.9 IN 500)
    515*  FABRIC FILTER BAG FABRIC (NAME X(8) IN 500)
    516*  FABRIC FILTER FABRIC COATING (NAME X(8) IN 500)
  600*  ESP (RG IN 300)
    601*  NUMBER OF ESPS (INTEGER NUMBER 99 IN 600)
    602*  ESP NUMBER OF SPARES (INTEGER NUMBER 99 IN 600)
    603*  ESP PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 IN 600)
    604*  ESP REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 9999 IN 60
          0)
```

(continued)

```
   605*  ESP TYPE - HOT SIDE/COLD SIDE (NAME X(8) IN 600)
   606*  ESP SUPPLIER (NAME X(8) IN 600)
   607*  ESP INLET FLUE GAS CAPACITY - ACFM (INTEGER NUMBER 9(9) IN
          600)
   608*  ESP INLET FLUE GAS TEMPERATURE - F (INTEGER NUMBER 9(5) IN
          600)
   609*  ESP PRESSURE DROP - IN H2O (DECIMAL NUMBER 99.99 IN 600)
   610*  ESP PART OUTLET LOAD - GR/SCF (DECIMAL NUMBER 999.99 IN 60
         0)
   611*  ESP PART REMOVAL EFFICIENCY - % (DECIMAL NUMBER 999.9 IN 6
         00)
   612*  ESP FLUE GAS CONDITIONING TYPE (NAME X(8) IN 600)
700*  PARTICLE SCRUBBER (RG IN 300)
   701*  NUMBER OF PART SCRUBBERS (INTEGER NUMBER 99 IN 700)
   702*  PART SCRUBBER NUMBER OF SPARES (INTEGER NUMBER 99 IN 700)
   703*  PART SCRUBBER PLACED IN SERVICE - YYMM (INTEGER NUMBER 999
         9 IN 700)
   704*  PART SCRUBBER REMOVED FROM SERVICE - YYMM (INTEGER NUMBER
         9999 IN 700)
   705*  PART SCRUBBER GENERIC TYPE (NAME X(8) IN 700)
   706*  PART SCRUBBER SPECIFIC TYPE (NAME X(8) IN 700)
   707*  PART SCRUBBER TRADE NAME (NAME X(8) IN 700)
   708*  PART SCRUBBER SUPPLIER (NAME X(8) IN 700)
   709*  PART SCRUBBER DIMENSIONS - FT (NAME X(8) IN 700)
   710*  PART SCRUBBER SHELL CONSTRUCTION MATERIAL GENERIC TYPE (NA
         ME X(8) IN 700)
   711*  PART SCRUBBER SHELL CONSTRUCTION MATERIAL SPECIFIC TYPE (N
         AME X(8) IN 700)
   712*  PART SCRUBBER SHELL CONSTRUCTION MATERIAL COMMON NAME (NAM
         E X(8) IN 700)
   713*  PART SCRUBBER LINER CONSTRUCTION MATERIAL GENERIC TYPE (NA
         ME X(8) IN 700)
   714*  PART SCRUBBER LINER CONSTRUCTION MATERIAL SPECIFIC TYPE (N
         AME X(8) IN 700)
   715*  PART SCRUBBER LINER CONSTRUCTION MATERIAL COMMON NAME (NAM
         E X(8) IN 700)
   716*  PART SCRUBBER % OF BOILER LOAD (DECIMAL NUMBER 999.9 IN 70
         0)
   717*  PART SCRUBBER GAS CONTACTING DEVICE TYPE (NAME X(8) IN 700
         )
   718*  PART SCRUBBER NUMBER OF GAS CONTACTING ZONES (INTEGER NUMB
         ER 999 IN 700)
   719*  PART SCRUBBER DISTANCE BETWEEN GAS CONTACTING ZONES - IN (
         DECIMAL NUMBER 99.99 IN 700)
   720*  PART SCRUBBER NUMBER OF SPRAY HEADERS (INTEGER NUMBER 9999
          IN 700)
   721*  PART SCRUBBER LIQUID RECIRCULATION RATE - GPM (INTEGER NUM
         BER 9(6) IN 700)
   722*  PART SCRUBBER L/G RATIO - GAL/1000ACF (DECIMAL NUMBER 99.9
          IN 700)
   723*  PART SCRUBBER PH CONTROL ADDITIVE (NAME X(8) IN 700)
   724*  PART SCRUBBER GAS-SIDE PRESSURE DROP - IN H2O (DECIMAL NUM
         BER 99.99 IN 700)
```

(continued)

```
          725*  PART SCRUBBER SUPERFICIAL GAS VELOCITY - FT/SEC (DECIMAL N
                UMBER 9(9).9 IN 700)
          726*  PART SCRUBBER INLET GAS FLOW RATE - ACFM (INTEGER NUMBER 9
                (9) IN 700)
          727*  PART SCRUBBER INLET GAS TEMPERATURE - F (INTEGER NUMBER 9(
                5) IN 700)
          728*  PART SCRUBBER INLET SO2 LEVEL - PPM (DECIMAL NUMBER 9999.9
                99 IN 700)
          729*  PART SCRUBBER INLET SO2 LEVEL - LB/MM BTU (DECIMAL NUMBER
                999.999 IN 700)
          730*  PART SCRUBBER INLET PART LEVEL - GR/SCF (DECIMAL NUMBER 99
                9.999 IN 700)
          731*  PART SCRUBBER INLET PART LEVEL - LB/MM BTU (DECIMAL NUMBER
                 9(5).999 IN 700)
          732*  PART SCRUBBER OUTLET GAS FLOW RATE - ACFM (INTEGER NUMBER
                9(9) IN 700)
          733*  PART SCRUBBER OUTLET GAS TEMPERATURE - F (INTEGER NUMBER 9
                (5) IN 700)
          734*  PART SCRUBBER OUTLET SO2 LEVEL - PPM (DECIMAL NUMBER 9(5).
                999 IN 700)
          735*  PART SCRUBBER OUTLET SO2 LEVEL - LB/MM BTU (DECIMAL NUMBER
                 999.999 IN 700)
          736*  PART SCRUBBER OUTLET PART LEVEL - GR/SCF (DECIMAL NUMBER 9
                9.999 IN 700)
          737*  PART SCRUBBER OUTLET PART LEVEL - LB/MM BTU (DECIMAL NUMBE
                R 9(5).999 IN 700)
          738*  PART SCRUBBER SO2 REMOVAL EFFICIENCY - % (DECIMAL NUMBER 9
                9.9 IN 700)
          739*  PART SCRUBBER PART REMOVAL EFFICIENCY - % (DECIMAL NUMBER
                999.9 IN 700)
     800*  FGD SYSTEM (RG)
       801*  SALEABLE PRODUCT/THROWAWAY PRODUCT (NAME X(8) IN 800)
       802*  SO2 REMOVAL MODE - WET SCRUBBING/SPRAY DRYING (NAME X(8) IN
             800)
       803*  PROCESS TYPE - LIME/LIMESTONE/ETC (NAME X(8) IN 800)
       804*  PROCESS ADDITIVES - MG/ADIPIC ACID/ETC (NAME X(8) IN 800)
       805*  FGD SYSTEM SUPPLIER (NAME X(8) IN 800)
       806*  A-E FIRM (NAME X(8) IN 800)
       807*  CONSTRUCTION FIRM (NAME X(8) IN 800)
       808*  FGD DEVELOPMENT LEVEL - FULL SCALE/DEMONSTRATION/PROTOTYPE (
             NAME X(8) IN 800)
       809*  NEW/RETROFIT (NAME X(8) IN 800)
       810*  TOTAL UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - % (DECIMAL N
             UMBER 99.99 IN 800)
       811*  TOTAL UNIT SO2 DESIGN REMOVAL EFFICIENCY - % (DECIMAL NUMBER
              99.99 IN 800)
       812*  FGD CURRENT STATUS - 1/2/3/4/5/6/7/8 (INTEGER NUMBER 99 IN 8
             00)
       813*  FGD TERMINATION DATE - YYMM (INTEGER NUMBER 9999 IN 800)
       814*  FGD COMMERCIAL START-UP - YYMM (INTEGER NUMBER 9999 IN 800)
       815*  FGD INITIAL START-UP - YYMM (INTEGER NUMBER 9999 IN 800)
       816*  FGD CONSTRUCTION COMPLETION - YYMM (INTEGER NUMBER 9999 IN 8
             00)
```

(continued)

```
817*  FGD CONSTRUCTION INITIATION - YYMM (INTEGER NUMBER 9999 IN 8
      00)
818*  FGD CONTRACT AWARDED - YYMM (INTEGER NUMBER 9999 IN 800)
819*  FGD LETTER OF INTENT SIGNED - YYMM (INTEGER NUMBER 9999 IN 8
      00)
820*  FGD INITIATED BID REQUEST - YYMM (INTEGER NUMBER 9999 IN 800
      )
821*  FGD INITIATED PRELIMINARY DESIGN - YYMM (INTEGER NUMBER 9999
       IN 800)
900*  FGD DESIGN & OPERATING PARAMETERS (RG IN 800)
  901*  DESIGN COAL SULFUR CONTENT - % (DECIMAL NUMBER 99.99 IN 90
        0)
  902*  DESIGN COAL HEAT CONTENT - BTU/LB (INTEGER NUMBER 9(6) IN
        900)
  903*  DESIGN COAL ASH CONTENT - % (DECIMAL NUMBER 99.99 IN 900)
  904*  DESIGN COAL MOISTURE CONTENT - % (DECIMAL NUMBER 99.99 IN
        900)
  905*  DESIGN COAL CHLORIDE CONTENT - % (DECIMAL NUMBER 99.99 IN
        900)
  906*  FGD SYSTEM SPACE REQUIREMENTS - SQ FT (INTEGER NUMBER 9(7)
         IN 900)
  907*  FGD SYSTEM OPERATION & MAINTENANCE REQUIREMENTS - MANHOURS
        /DAY (DECIMAL NUMBER 999.9 IN 900)
  908*  FGD SYSTEM OPERATION & MAINTENANCE REQUIREMENTS - OPERATOR
        S/SHIFT (INTEGER NUMBER 99 IN 900)
  909*  FGD SYSTEM OPERATION & MAINTENANCE REQUIREMENTS - MAINTENA
        NCE PERSONNEL/SHIFT (INTEGER NUMBER 999 IN 900)
  910*  FGD SYSTEM TURNDOWN RATIO (NAME X(8) IN 900)
  911*  OVERALL FGD SYSTEM OXIDATION - % (DECIMAL NUMBER 999.9 IN
        900)
  912*  FGD SYSTEM BYPASS CAPABILITY - YES/NO (NAME X(8) IN 900)
1000*  QUENCHER/PRESATURATOR (RG IN 900)
  1001*  NUMBER OF QUENCHERS/PRESATURATORS (INTEGER NUMBER 99 IN
         1000)
  1002*  QUENCHER/PRESATURATOR PLACED IN SERVICE - YYMM (INTEGER
         NUMBER 9999 IN 1000)
  1003*  QUENCHER/PRESATURATOR REMOVED FROM SERVICE - YYMM (INTEG
         ER NUMBER 9999 IN 1000)
  1004*  QUENCHER/PRESATURATOR TYPE (NAME X(8) IN 1000)
  1005*  QUENCHER/PRESATURATOR LOCATION (NAME X(8) IN 1000)
  1006*  QUENCHER/PRESATURATOR SUPPLIER (NAME X(8) IN 1000)
  1007*  QUENCHER/PRESATURATOR INLET GAS FLOW - ACFM (INTEGER NUM
         BER 9(9) IN 1000)
  1008*  QUENCHER/PRESATURATOR INLET GAS TEMPERATURE - F (INTEGER
          NUMBER 9(9) IN 1000)
  1009*  QUENCHER/PRESATURATOR PRESSURE DROP - IN H2O (DECIMAL NU
         MBER 99.9 IN 1000)
  1010*  QUENCHER/PRESATURATOR LIQUID RECIRCULATION RATE - GPM (I
         NTEGER NUMBER 9(6) IN 1000)
```

(continued)

```
  1011*  QUENCHER/PRESATURATOR L/G RATIO - GAL/1000 ACF (DECIMAL
         NUMBER 99.9 IN 1000)
  1012*  QUENCHER/PRESATURATOR NUMBER OF SPRAY HEADERS (INTEGER N
         UMBER 9999 IN 1000)
  1013*  QUENCHER/PRESATURATOR CONSTRUCTION MATERIAL GENERIC TYPE
          (NAME X(8) IN 1000)
  1014*  QUENCHER/PRESATURATOR CONSTRUCTION MATERIAL SPECIFIC TYP
         E (NAME X(8) IN 1000)
  1015*  QUENCHER/PRESATURATOR CONSTRUCTION MATERIAL COMMON NAME
         (NAME X(8) IN 1000)
1100*  ABSORBER (RG IN 900)
  1101*  NUMBER OF ABSORBERS (INTEGER NUMBER 99 IN 1100)
  1102*  ABSORBER NUMBER OF SPARES (INTEGER NUMBER 99 IN 1100)
  1103*  ABSORBER PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 I
         N 1100)
  1104*  ABSORBER REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 999
         9 IN 1100)
  1105*  ABSORBER GENERIC TYPE (NAME X(8) IN 1100)
  1106*  ABSORBER SPECIFIC TYPE (NAME X(8) IN 1100)
  1107*  ABSORBER TRADE NAME (NAME X(8) IN 1100)
  1108*  ABSORBER SUPPLIER (NAME X(8) IN 1100)
  1109*  ABSORBER DIMENSIONS - FT (NAME X(8) IN 1100)
  1110*  ABSORBER SHELL CONSTRUCTION MATERIAL GENERIC TYPE (NAME
         X(8) IN 1100)
  1111*  ABSORBER SHELL CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME
          X(8) IN 1100)
  1112*  ABSORBER SHELL CONSTRUCTION MATERIAL COMMON NAME (NAME X
         (8) IN 1100)
  1113*  ABSORBER LINER CONSTRUCTION MATERIAL GENERIC TYPE (NAME
         X(8) IN 1100)
  1114*  ABSORBER LINER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME
          X(8) IN 1100)
  1115*  ABSORBER LINER CONSTRUCTION MATERIAL COMMON NAME (NAME X
         (8) IN 1100)
  1116*  ABSORBER % OF BOILER LOAD (DECIMAL NUMBER 999.9 IN 1100)

  1117*  ABSORBER GAS CONTACTING DEVICE TYPE (NAME X(8) IN 1100)
  1118*  ABSORBER NUMBER OF GAS CONTACTING ZONES (INTEGER NUMBER
         999 IN 1100)
  1119*  ABSORBER DISTANCE BETWEEN GAS CONTACTING ZONES - IN (DEC
         IMAL NUMBER 99.99 IN 1100)
  1120*  ABSORBER NUMBER OF SPRAY HEADERS (INTEGER NUMBER 9999 IN
          1100)
  1121*  ABSORBER LIQUID RECIRCULATION RATE - GPM (INTEGER NUMBER
          9(6) IN 1100)
  1122*  ABSORBER L/G RATIO - GAL/1000ACF (DECIMAL NUMBER 99.9 IN
          1100)
  1123*  ABSORBER GAS-SIDE PRESSURE DROP - IN H2O (DECIMAL NUMBER
          99.99 IN 1100)
  1124*  ABSORBER SUPERFICIAL GAS VELOCITY - FT/SEC (DECIMAL NUMB
         ER 9(9).9 IN 1100)
```

(continued)

```
   1125*  ABSORBER INLET GAS FLOW RATE - ACFM (INTEGER NUMBER 9(9)
           IN 1100)
   1126*  ABSORBER INLET GAS TEMPERATURE - F (INTEGER NUMBER 9(5)
          IN 1100)
   1127*  ABSORBER INLET SO2 LEVEL - PPM (DECIMAL NUMBER 9999.999
          IN 1100)
   1128*  ABSORBER INLET SO2 LEVEL - LB/MM BTU (DECIMAL NUMBER 999
          .999 IN 1100)
   1129*  ABSORBER INLET PART LEVEL - GR/SCF (DECIMAL NUMBER 999.9
          99 IN 1100)
   1130*  ABSORBER INLET PART LEVEL - LB/MM BTU (DECIMAL NUMBER 9(
          5).999 IN 1100)
   1131*  ABSORBER OUTLET GAS FLOW RATE - ACFM (INTEGER NUMBER 9(9
          ) IN 1100)
   1132*  ABSORBER OUTLET GAS TEMPERATURE - F (INTEGER NUMBER 9(5)
           IN 1100)
   1133*  ABSORBER OUTLET SO2 LEVEL - PPM (DECIMAL NUMBER 9(5).999
           IN 1100)
   1134*  ABSORBER OUTLET SO2 LEVEL - LB/MM BTU (DECIMAL NUMBER 99
          9.999 IN 1100)
   1135*  ABSORBER OUTLET PART LEVEL - GR/SCF (DECIMAL NUMBER 99.9
          99 IN 1100)
   1136*  ABSORBER OUTLET PART LEVEL - LB/MM BTU (DECIMAL NUMBER 9
          (5).999 IN 1100)
   1137*  ABSORBER SO2 REMOVAL EFFICIENCY - % (DECIMAL NUMBER 99.9
           IN 1100)
   1138*  ABSORBER PART REMOVAL EFFICIENCY - % (DECIMAL NUMBER 999
          .9 IN 1100)
   1139*  ABSORBER TURNDOWN RATIO (NAME X(8) IN 1100)
   1140*  ABSORBER TURNDOWN METHOD (NAME X(8) IN 1100)
   1141*  ABSORBER NOZZLE CONSTRUCTION MATERIAL TYPE (NAME X(8) IN
           1100)
   1142*  ABSORBER NOZZLE PRESSURE DROP - IN H2O (DECIMAL NUMBER 9
          9.99 IN 1100)
 1200*  MIST ELIMINATOR (RG IN 900)
   1201*  ME FUNCTION - PRE-MIST ELIMINATOR/MIST ELIMINATOR (NAME
          X(8) IN 1200)
   1202*  TOTAL NUMBER OF ME'S - PER SYSTEM (INTEGER NUMBER 99 IN
          1200)
   1203*  TOTAL NUMBER OF ME SPARES - PER SYSTEM (INTEGER NUMBER 9
           IN 1200)
   1204*  NUMBER OF ME'S PER MODULE (INTEGER NUMBER 99 IN 1200)
   1205*  ME PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 IN 1200
          )
   1206*  ME REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 9999 IN 1
          200)
   1207*  ME TYPE - IMPINGEMENT/CENTRIFUGAL/CYCLONIC/GAS DIRECTION
           SHIFT (NAME X(8) IN 1200)
   1208*  ME DESIGN - CHEVRON/BAFFLE/WIRE MESH/TUBE BANK/ESP/GULL
          WING /RADIAL VANE/PERFORATED PLATE/ETC (NAME X(8) IN 120
          0)
   1209*  ME TRADE NAME (NAME X(8) IN 1200)
```

(continued)

```
    1210*  ME MANUFACTURER (NAME X(8) IN 1200)
    1211*  ME CONFIGURATION - HORIZONTAL/VERTICAL (NAME X(8) IN 120
           0)
    1212*  ME SHAPE - Z-SHAPE/A-FRAME (NAME X(8) IN 1200)
    1213*  ME NUMBER OF STAGES (INTEGER NUMBER 99 IN 1200)
    1214*  ME NUMBER OF PASSES/STAGE (INTEGER NUMBER 99 IN 1200)
    1215*  ME FREEBOARD DISTANCE - FT (DECIMAL NUMBER 99.9 IN 1200)

    1216*  ME DISTANCE BETWEEN STAGES - IN (DECIMAL NUMBER 999.9 IN
            1200)
    1217*  ME DISTANCE BETWEEN VANES - IN (DECIMAL NUMBER 99.9 IN 1
           200)
    1218*  ME VANE ANGLES - DEGREES (INTEGER NUMBER 999 IN 1200)
    1219*  ME PRESSURE DROP - IN H2O (DECIMAL NUMBER 99.9 IN 1200)
    1220*  ME SUPERFICIAL GAS VELOCITY - FT/SEC (DECIMAL NUMBER 999
           .9 IN 1200)
    1221*  ME CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(8) IN 1200
           )
    1222*  ME CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(8) IN 120
           0)
    1223*  ME CONSTRUCTION MATERIAL COMMON NAME (NAME X(8) IN 1200)

    1224*  ME WASH WATER SOURCE - FRESH/BLENDED/SUPERNATANT (NAME X
           (8) IN 1200)
    1225*  ME POINT OF WASH WATER COLLECTION (NAME X(8) IN 1200)
    1226*  ME WASH DIRECTION - OVERSPRAY/UNDERSPRAY-FRONTSPRAY/BACK
           SPRAY (NAME X(8) IN 1200)
    1227*  ME WASH FREQUENCY (NAME X(8) IN 1200)
    1228*  ME WASH DURATION (NAME X(8) IN 1200)
    1229*  ME WASH RATE - GAL/MIN (INTEGER NUMBER 9(5) IN 1200)
    1230*  ME WASH COVERAGE - GAL/MIN/SQ FT (INTEGER NUMBER 9(5) IN
            1200)
 1300*  REHEATER (RG IN 900)
   1301*  NUMBER OF REHEATERS (INTEGER NUMBER 99 IN 1300)
   1302*  REHEATER NUMBER OF SPARES (INTEGER NUMBER 9 IN 1300)
   1303*  REHEATER NUMBER PER MODULE (INTEGER NUMBER 99 IN 1300)
   1304*  REHEATER PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 I
          N 1300)
   1305*  REHEATER REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 999
          9 IN 1300)
   1306*  REHEATER GENERIC TYPE - IN-LINE/INDIRECT HOT AIR/ETC (NA
          ME X(8) IN 1300)
   1307*  REHEATER SPECIFIC TYPE - STEAM/HOT WATER/ETC (NAME X(8)
          IN 1300)
   1308*  REHEATER COMMON DESIGN - BARE TUBE/FIN TUBE/ETC (NAME X(
          8) IN 1300)
   1309*  REHEATER COMBUSTION FUEL SULFUR CONTENT - % (DECIMAL NUM
          BER 99.9 IN 1300)
   1310*  REHEATER LOCATION (NAME X(8) IN 1300)
   1311*  REHEATER % OF GAS BYPASSED (DECIMAL NUMBER 99.9 IN 1300)
```

(continued)

```
   1312*  REHEATER TEMPERATURE INCREASE - F (INTEGER NUMBER 999 IN
           1300)
   1313*  REHEATER INLET FLUE GAS FLOW RATE - ACFM (INTEGER NUMBER
           9(9) IN 1300)
   1314*  REHEATER INLET FLUE GAS TEMPERATURE - F (INTEGER NUMBER
          9999 IN 1300)
   1315*  REHEATER OUTLET FLUE GAS FLOW RATE - ACFM (INTEGER NUMBE
          R 9(9) IN 1300)
   1316*  REHEATER OUTLET FLUE GAS TEMPERATURE - F (INTEGER NUMBER
           9999 IN 1300)
   1317*  REHEATER NUMBER OF HEAT EXCHANGER BANKS (INTEGER NUMBER
          9999 IN 1300)
   1318*  REHEATER NUMBER OF BUNDLES PER BANK (INTEGER NUMBER 99 I
          N 1300)
   1319*  REHEATER NUMBER OF TUBES PER BUNDLE (INTEGER NUMBER 999
          IN 1300)
   1320*  REHEATER SELF CLEANING DEVICE TYPE (NAME X(8) IN 1300)
   1321*  REHEATER CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(8) I
          N 1300)
   1322*  REHEATER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(8)
          IN 1300)
   1323*  REHEATER CONSTRUCTION MATERIAL COMMON NAME (NAME X(8) IN
           1300)
   1324*  REHEATER STEAM PRESSURE - PSIG (INTEGER NUMBER 9(5) IN 1
          300)
   1325*  REHEATER STEAM TEMPERATURE - F (INTEGER NUMBER 999 IN 13
          00)
   1326*  REHEATER ENERGY REQUIREMENT - MM BTU/HR (INTEGER NUMBER
          999 IN 1300)
1400*  FANS (RG IN 900)
  1401*  NUMBER OF FANS (INTEGER NUMBER 99 IN 1400)
  1402*  FAN NUMBER OF SPARES (INTEGER NUMBER 9 IN 1400)
  1403*  FAN PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 IN 140
         0)
  1404*  FAN REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 9999 IN
         1400)
  1405*  FAN DESIGN - CENTRIFUGAL/AXIAL (NAME X(8) IN 1400)
  1406*  FAN SUPPLIER (NAME X(8) IN 1400)
  1407*  FAN FUNCTION - UNIT/BOOSTER (NAME X(8) IN 1400)
  1408*  FAN APPLICATION WRT FGD SYSTEM - ID/FD/BALANCED DRAFT (N
         AME X(8) IN 1400)
  1409*  FAN SERVICE - WET/DRY (NAME X(8) IN 1400)
  1410*  FAN LOCATION WRT MAJOR COMPONENTS (NAME X(8) IN 1400)
  1411*  FAN FLUE GAS FLOW RATE - ACFM (INTEGER NUMBER 9(9) IN 14
         00)
  1412*  FAN FLUE GAS TEMPERATURE - F (INTEGER NUMBER 9999 IN 140
         0)
  1413*  FAN PRESSURE DROP - IN H2O (DECIMAL NUMBER 99.9 IN 1400)

  1414*  FAN CONSTRUCTION MATERIAL GENERIC TYOE (NAME X(8) IN 140
         0)
```

(continued)

```
  1415* FAN CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(8) IN 14
        00)
  1416* FAN CONSTRUCTION MATERIAL COMMON NAME (NAME X(8) IN 1400
        )
 1500* DAMPERS (RG IN 900)
  1501* NUMBER OF DAMPERS (INTEGER NUMBER 99 IN 1500)
  1502* DAMPER PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 IN
        1500)
  1503* DAMPER REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 9999
        IN 1500)
  1504* DAMPER FUNCTION - CONTROL/SHUT-OFF (NAME X(8) IN 1500)
  1505* DAMPER GENERIC TYPE - LOUVER/BUTTERFLY/ETC (NAME X(8) IN
         1500)
  1506* DAMPER SPECIFIC TYPE - OPPOSED BLADE/PARALLEL BLADE/ETC
        (NAME X(8) IN 1500)
  1507* DAMPER COMMON DESIGN - SINGLE LOUVER/DOUBLE LOUVER (NAME
         X(8) IN 1500)
  1508* DAMPER MANUFACTURER (NAME X(8) IN 1500)
  1509* DAMPER MODULATION - OPEN/CLOSED/ETC (NAME X(8) IN 1500)
  1510* DAMPER SEAL AIR ACFM - WHEN APPLICABLE (INTEGER NUMBER 9
        (5) IN 1500)
  1511* DAMPER SERVICE CONDITIONS - MAX GAS TEMP/TIME (NAME X(8)
         IN 1500)
  1512* DAMPER CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(8) IN
        1500)
  1513* DAMPER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(8) IN
         1500)
  1514* DAMPER CONSTRUCTION MATERIAL COMMON NAME (NAME X(8) IN 1
        500)
  1515* DAMPER LINER CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(
        8) IN 1500)
  1516* DAMPER LINER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X
        (8) IN 1500)
  1517* DAMPER LINER CONSTRUCTION MATERIAL COMMON NAME (NAME X(8
        ) IN 1500)
 1600* DUCTWORK (RG IN 900)
  1601* DUCTWORK LOCATION (NAME X(8) IN 1600)
  1602* DUCTWORK CONFIGURATION - CIRCULAR/RECTANGULAR/ETC (NAME
        X(8) IN 1600)
  1603* DUCTWORK DIMENSIONS - DIAMETER/LENGTH/ETC (NAME X(8) IN
        1600)
  1604* DUCTWORK SHELL CONSTRUCTION MATERIAL GENERIC TYPE (NAME
        X(8) IN 1600)
  1605* DUCTWORK SHELL CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME
         X(8) IN 1600)
  1606* DUCTWORK SHELL CONSTRUCTION MATERIAL COMMON NAME (NAME X
        (8) IN 1600)
  1607* DUCTWORK LINER CONSTRUCTION MATERIAL GENERIC TYPE (NAME
        X(8) IN 1600)
  1608* DUCTWORK LINER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME
         X(8) IN 1600)
```

(continued)

```
      1609*  DUCTWORK LINER CONSTRUCTION MATERIAL COMMON NAME (NAME X
             (8) IN 1600)
    1650*  EXPANSION JOINTS (RG IN 900)
      1651*  EXPANSION JOINT LOCATION (NAME X(8) IN 1650)
      1652*  EXPANSION JOINT TYPE - METALLIC/ELASTOMERIC (NAME X(8) I
             N 1650)
      1653*  EXPANSION JOINT FUNCTION - GAS CIRCUIT/LIQUID CIRCUIT (N
             AME X(8) IN 1650)
      1654*  EXPANSION JOINT PRESSURE - POSITIVE/NEGATIVE (NAME X(8)
             IN 1650)
      1655*  EXPANSION JOINT OPERATING TEMPERATURE - F (INTEGER NUMBE
             R 999 IN 1650)
      1656*  EXPANSION JOINT DESIGN CONFIGURATION - U-SHAPED/ETC (NAM
             E X(8) IN 1650)
      1657*  EXPANSION JOINT SHELL CONSTRUCTION MATERIAL GENERIC TYPE
              (NAME X(8) IN 1650)
      1658*  EXPANSION JOINT SHELL CONSTRUCTION MATERIAL SPECIFIC TYP
             E (NAME X(8) IN 1650)
      1659*  EXPANSION JOINT SHELL CONSTRUCTION MATERIAL COMMON NAME
             (NAME X(8) IN 1650)
      1660*  EXPANSION JOINT LINER CONSTRUCTION MATERIAL GENERIC TYPE
              (NAME X(8) IN 1650)
      1661*  EXPANSION JOINT LINER CONSTRUCTION MATERIAL SPECIFIC TYP
             E (NAME X(8) IN 1650)
      1662*  EXPANSION JOINT LINER CONSTRUCTION MATERIAL COMMON NAME
             (NAME X(8) IN 1650)
    1700*  REAGENT PREPARATION EQUIPMENT (RG IN 900)
      1701*  FUNCTION - L/S GRINDING/LIME SLAKING/ETC (NAME X(8) IN 1
             700)
      1702*  REAGENT PREP DEVICE - BALL MILL/CRUSHER/ETC (NAME X(8) I
             N 1700)
      1703*  REAGENT PREP DEVICE TYPE - TUBE MILL/CONICAL MILL /ETC (
             NAME X(8) IN 1700)
      1704*  REAGENT PREP DEVICE MANUFACTURER (NAME X(8) IN 1700)
      1705*  REAGENT PREP NUMBER OF DEVICES (INTEGER NUMBER 99 IN 170
             0)
      1706*  REAGENT PREP NUMBER OF SPARES (INTEGER NUMBER 9 IN 1700)

      1707*  REAGENT PREP DEVICE PLACED IN SERVICE - YYMM (INTEGER NU
             MBER 9999 IN 1700)
      1708*  REAGENT PREP DEVICE REMOVED FROM SERVICE - YYMM (INTEGER
              NUMBER 9999 IN 1700)
      1709*  REAGENT PREP DEVICE FULL LOAD DRY FEED CAPACITY - TPH (I
             NTEGER NUMBER 9999 IN 1700)
      1710*  REAGENT PREP DEVICE PRODUCT QUALITY - % SOLIDS (DECIMAL
             NUMBER 99.9 IN 1700)
      1711*  REAGENT PREP FULL LOAD PRODUCT QUANTITY EMPLOYED - GPM (
             INTEGER NUMBER 9999 IN 1700)
      1712*  REAGENT PREP POINT OF ADDITION (NAME X(8) IN 1700)
      1713*  REAGENT ON-SITE STORAGE CAPACITY - DAYS (INTEGER NUMBER
             999 IN 1700)
```

(continued)

```
1800*  TANKS (RG IN 900)
  1801*  TANK FUNCTION - ABSORBER EFFLUENT HOLD TANK/ETC (NAME X(
         8) IN 1800)
  1802*  NUMBER OF TANKS (INTEGER NUMBER 99 IN 1800)
  1803*  TANK NUMBER OF SPARES (INTEGER NUMBER 9 IN 1800)
  1804*  TANK PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 IN 18
         00)
  1805*  TANK REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 9999 IN
          1800)
  1806*  TANK TYPE (NAME X(8) IN 1800)
  1807*  TANK LOCATION (NAME X(8) IN 1800)
  1808*  TANK CONFIGURATION (NAME X(8) IN 1800)
  1809*  TANK DIMENSIONS - FT (NAME X(8) IN 1800)
  1810*  TANK CAPACITY - GAL (INTEGER NUMBER 9(7) IN 1800)
  1811*  TANK RETENTION TIME (NAME X(8) IN 1800)
  1812*  TANK NUMBER OF AGITATORS (INTEGER NUMBER 99 IN 1800)
  1813*  TANK CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(8) IN 18
         00)
  1814*  TANK CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(8) IN 1
         800)
  1815*  TANK CONSTRUCTION MATERIAL COMMON NAME (NAME X(8) IN 180
         0)
1900*  PUMPS (RG IN 900)
  1901*  PUMP FUNCTION - ADDITIVE FEED/ABSORBER RECIRCULATION/ETC
           (NAME X(8) IN 1900)
  1902*  NUMBER OF PUMPS (INTEGER NUMBER 99 IN 1900)
  1903*  PUMP NUMBER OF SPARES (INTEGER NUMBER 9 IN 1900)
  1904*  PUMP PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 IN 19
         00)
  1905*  PUMP REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 9999 IN
          1900)
  1906*  PUMP GENERIC TYPE - CENTRIFUGAL/DIPHRAGM/ETC (NAME X(8)
         IN 1900)
  1907*  PUMP MANUFACTURER (NAME X(8) IN 1900)
  1908*  PUMP MODEL (NAME X(8) IN 1900)
  1909*  PUMP DRIVE - BELT/VARIABLE/DIRECT/ETC (NAME X(8) IN 1900
         )
  1910*  PUMP CAPACITY - GPM (INTEGER NUMBER 9(5) IN 1900)
  1911*  PUMP MOTOR BRAKE HP (INTEGER NUMBER 9(5) IN 1900)
  1912*  PUMP SPEED - RPM (INTEGER NUMBER 9(5) IN 1900)
  1913*  PUMP HEAD - FT (DECIMAL NUMBER 999.9 IN 1900)
  1914*  PUMP SERVICE - PH/SOLIDS (NAME X(8) IN 1900)
  1915*  PUMP CASING CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(8
         ) IN 1900)
  1916*  PUMP CASING CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(
         8) IN 1900)
  1917*  PUMP CASING CONSTRUCTION MATERIAL COMMON NAME (NAME X(8)
          IN 1900)
  1918*  PUMP IMPELLER CONSTRUCTION MATERIAL GENERIC TYPE (NAME X
         (8) IN 1900)
  1919*  PUMP IMPELLER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME
         X(8) IN 1900)
```

(continued)

```
  1920*  PUMP IMPELLER CONSTRUCTION MATERIAL COMMON NAME (NAME X(
         8) IN 1900)
  1921*  PUMP LINER CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(8)
          IN 1900)
  1922*  PUMP LINER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(8
         ) IN 1900)
  1923*  PUMP LINER CONSTRUCTION MATERIAL COMMON NAME (NAME X(8)
         IN 1900)
  1924*  PUMP SPECIFIC TYPE - BELT DRIVE/DIRECT DRIVE (NAME X(8)
         IN 1900)
  1925*  PUMP COMMON DESIGN - V-BELT/ETC (NAME X(8) IN 1900)
2000*  SOLIDS CONCENTRATING/DEWATERING (RG IN 900)
  2001*  CONCENTRATING/DEWATERING DEVICE GENERIC TYPE- THICKENER/
         VACUUM FILTER/ETC (NAME X(8) IN 2000)
  2002*  DEVICE FUNCTION - THICKENING/FILTRATION/ETC (NAME X(8) I
         N 2000)
  2003*  NUMBER OF CONCENTRATING/DEWATERING DEVICES (INTEGER NUMB
         ER 99 IN 2000)
  2004*  NUMBER OF SPARE CONCENTRATING/DEWATERING DEVICES (NAME X
         (8) IN 2000)
  2005*  DEVICE PLACED IN SERVICE - YYMM (INTEGER NUMBER 9999 IN
         2000)
  2006*  DEVICE REMOVED FROM SERVICE - YYMM (INTEGER NUMBER 9999
         IN 2000)
  2007*  DEVICE CONFIGURATION (NAME X(8) IN 2000)
  2008*  DEVICE DIMENSIONS - FT (NAME X(8) IN 2000)
  2009*  DEVICE CAPACITY (NAME X(8) IN 2000)
  2010*  DEVICE SHELL CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(
         8) IN 2000)
  2011*  DEVICE SHELL CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X
         (8) IN 2000)
  2012*  DEVICE SHELL CONSTRUCTION MATERIAL COMMON NAME (NAME X(8
         ) IN 2000)
  2013*  DEVICE LINER CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(
         8) IN 2000)
  2014*  DEVICE LINER CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X
         (8) IN 2000)
  2015*  DEVICE LINER CONSTRUCTION MATERIAL COMMON NAME (NAME X(8
         ) IN 2000)
  2016*  DEVICE BELT CONSTRUCTION MATERIAL GENERIC TYPE (NAME X(8
         ) IN 2000)
  2017*  DEVICE BELT CONSTRUCTION MATERIAL SPECIFIC TYPE (NAME X(
         8) IN 2000)
  2018*  DEVICE BELT CONSTRUCTION MATERIAL COMMON NAME (NAME X(8)
          IN 2000)
  2019*  DEVICE FEED STREAM SOURCE - ABSORBER BLEED/THICKENER UND
         ERFLOW/ ETC (NAME X(8) IN 2000)
  2020*  DEVICE FEED STREAM CHARACTERISTICS - VOLUME FLOW RATE/%
         SOLIDS (NAME X(8) IN 2000)
  2021*  OUTLET STREAM CHARACTERISTICS - VOLUME FLOW RATE/% SOLID
         S (NAME X(8) IN 2000)
```

(continued)

```
      2022*  OVERFLOW STREAM CHARACTERISTICS - VOLUME FLOW RATE/% SOL
             IDS (NAME X(8) IN 2000)
      2023*  OUTLET STREAM DISPOSITION (NAME X(8) IN 2000)
      2024*  OVERFLOW STREAM DISPOSITION (NAME X(8) IN 2000)
      2025*  CONCENTRATING/DEWATERING DEVICE SPECIFIC TYPE - DRUM/HOR
             IZONTAL BELT/ETC (NAME X(8) IN 2000)
      2026*  CONCENTRATING/DEWATERING DEVICE COMMON DESIGN - ROTARY/B
             ELT FILTER/ETC (NAME X(8) IN 2000)
    2100*  END PRODUCT (RG IN 900)
      2200*  RECOVERABLE BYPRODUCT (RG IN 2100)
        2201*  BYPRODUCT NATURE - GYPSUM/ELEMENTAL SULFUR/ETC (NAME X
               (8) IN 2200)
        2202*  FULL LOAD BYPRODUCT QUANTITY - TPH (DECIMAL NUMBER 99.
               9 IN 2200)
        2203*  BYPRODUCT QUALITY - % (DECIMAL NUMBER 999.9 IN 2200)
        2204*  BYPRODUCT DISPOSITION - ACID PLANT/FERTILIZER PLANT/ET
               C (NAME X(8) IN 2200)
        2205*  NATURE OF END PRODUCT - SULFUR/SULFURIC ACID/ETC (NAME
                X(8) IN 2200)
      2300*  SLUDGE (RG IN 2100)
        2301*  FULL LOAD SLUDGE QUANTITY - TPH/DRY (DECIMAL NUMBER 99
               .9 IN 2300)
        2302*  SLUDGE MOISTURE CONTENT - % TOTAL FREE WATER (DECIMAL
               NUMBER 99.9 IN 2300)
        2303*  SLUDGE % CASO3 - DRY (DECIMAL NUMBER 99.9 IN 2300)
        2304*  SLUDGE % CASO4 - DRY (DECIMAL NUMBER 99.9 IN 2300)
        2305*  SLUDGE % CAOH2 - DRY (DECIMAL NUMBER 99.9 IN 2300)
        2306*  SLUDGE % CACO3 - DRY (DECIMAL NUMBER 99.9 IN 2300)
        2307*  SLUDGE % ASH - DRY (DECIMAL NUMBER 99.9 IN 2300)
        2308*  SLUDGE % SODIUM COMPOUNDS - DRY (DECIMAL NUMBER 99.9 I
               N 2300)
        2309*  SLUDGE % OTHER COMPOUNDS - DRY (DECIMAL NUMBER 99.9 IN
                2300)
        2400*  TREATMENT (RG IN 2300)
          2401*  TREATMENT METHOD (NAME X(8) IN 2400)
          2402*  TREATMENT METHOD PLACED IN SERVICE - YYMM (INTEGER N
                 UMBER 9999 IN 2400)
          2403*  TREATMENT METHOD REMOVED FROM SERVICE - YYMM (INTEGE
                 R NUMBER 9999 IN 2400)
          2404*  TREATMENT DEVICE - OXIDATION TANK/PUG MILL/ETC (NAME
                  X(8) IN 2400)
          2405*  TREATMENT PROPRIETARY PROCESS - IUCS/DRAVO/ETC (NAME
                  X(8) IN 2400)
          2406*  TREATMENT INLET FLOW RATE - GPM (INTEGER NUMBER 9(5)
                  IN 2400)
          2407*  TREATMENT INLET QUALITY - % SOLIDS (DECIMAL NUMBER 9
                 99.9 IN 2400)
          2408*  TREATMENT COMMON DESIGN - RECYCLE STREAM/BLEED STREA
                 M/ETC (NAME X(8) IN 2400)
        2500*  DISPOSAL (RG IN 2300)
          2501*  NATURE - INTERIM/FINAL (NAME X(8) IN 2500)
```

(continued)

```
      2502*  DISPOSAL GENERIC TYPE - LANDFILL/POND/ETC (NAME X(8)
              IN 2500)
      2503*  DISPOSAL LOCATION - ON-SITE/OFF-SITE (NAME X(8) IN 2
             500)
      2504*  DISPOSAL SITE TRANSPORTATION METHOD - PIPE LINE/TRUC
             K/ETC (NAME X(8) IN 2500)
      2505*  DISPOSAL SITE TREATMENT - CLAY LINING/SYNTHETIC LINI
             NG/ETC (NAME X(8) IN 2500)
      2506*  DISPOSAL SITE DIMENSIONS - AREA/DEPTH (NAME X(8) IN
             2500)
      2507*  DISPOSAL SITE CAPACITY - VOLUME/ACRE-FT/TONS (DECIMA
             L NUMBER 9(6).9 IN 2500)
      2508*  DISPOSAL SITE SERVICE LIFE - YRS (INTEGER NUMBER 999
              IN 2500)
      2509*  DISPOSAL SPECIFIC TYPE - DIKED/SIDE HILL/ETC (NAME X
             (8) IN 2500)
      2510*  DISPOSAL COMMON DESIGN - ABANDONED SURFACE MINE/ETC
             (NAME X(8) IN 2500)
  2600*  PROCESS CONTROL & INSTRUMENTATION (RG IN 900)
    2601*  PROCESS STREAM (NAME X(8) IN 2600)
    2602*  CHEMICAL PARAMETERS - PH/ETC (NAME X(8) IN 2600)
    2603*  PHYSICAL PARAMETERS - % SOLIDS/FLOW/ETC (NAME X(8) IN 26
           00)
    2604*  CONTROL LEVELS (NAME X(8) IN 2600)
    2605*  MONITOR TYPE (NAME X(8) IN 2600)
    2606*  MONITOR LOCATION (NAME X(8) IN 2600)
    2607*  PROCESS CONTROL MANNER - AUTOMATIC/MANUAL (NAME X(8) IN
           2600)
    2608*  PROCESS CHEMISTRY MODE - FEEDBACK/FEED FORWARD (NAME X(8
           ) IN 2600)
  2700*  WATER BALANCE (RG IN 900)
    2701*  WATER BALANCE ENTRIES - DESIGN/ACTUAL (NAME X(8) IN 2700
           )
    2702*  WATER LOOP TYPE - OPEN/CLOSED (NAME X(8) IN 2700)
    2703*  EVAPORATION WATER LOSS - GPM (INTEGER NUMBER 9(5) IN 270
           0)
    2704*  SLUDGE HYDRATION WATER LOSS - GPM (INTEGER NUMBER 9(5) I
           N 2700)
    2705*  SLUDGE INTERSTITIAL WATER LOSS - GPM (INTEGER NUMBER 9(5
           ) IN 2700)
    2706*  POND SEEPAGE/RUNOFF WATER LOSS (NAME X(8) IN 2700)
    2707*  EFFLUENT WATER LOSS - GPM (INTEGER NUMBER 9(5) IN 2700)
    2708*  RECEIVING WATER STREAM NAME (NAME X(8) IN 2700)
    2709*  MAKEUP WATER ADDITION - GPM (INTEGER NUMBER 9(5) IN 2700
           )
    2710*  SOURCE OF MAKEUP WATER - RIVER WATER/ETC (NAME X(8) IN 2
           700)
    2711*  MAKEUP WATER ADDITION POINTS & AMOUNTS (NAME X(8) IN 270
           0)
    2712*  MAKEUP WATER PRE-TREATMENT TYPE (NAME X(8) IN 2700)
  2800*  CHEMICALS & CONSUMPTION (RG IN 900)
```

(continued)

```
      2801*  CHEMICAL FUNCTION - ABSORBENT/SOLIDS SETTLING/ETC (NAME
             X(8) IN 2800)
      2802*  CHEMICAL NAME - LIMESTONE/ADIPIC ACID/ETC (NAME X(8) IN
             2800)
      2803*  CHEMICAL PRINCIPAL CONSTITUENT (NAME X(8) IN 2800)
      2804*  CHEMICAL SOURCE/SUPPLIER (NAME X(8) IN 2800)
      2805*  CHEMICAL CONSUMPTION - SPECIFY TPY/TPH/ETC (NAME X(8) IN
              2800)
      2806*  CHEMICAL UTILIZATION - % (DECIMAL NUMBER 999.9 IN 2800)
      2807*  CHEMICAL POINT OF ADDITION (NAME X(8) IN 2800)
      2808*  CHEMICAL SUPPLIER LOCATION (NAME X(8) IN 2800)
    2900*  MAJOR PIPING & VALVES (RG IN 900)
      2901*  PIPE/VALVE (NAME X(8) IN 2900)
      2902*  PIPE/VALVE LOCATION (NAME X(8) IN 2900)
      2903*  PIPE/VALVE FUNCTION - INSTRUMENT AIR/SERVICE WATER/ETC (
             NAME X(8) IN 2900)
      2904*  PIPE/VALVE TYPE - BALL/GLOBE/ETC (NAME X(8) IN 2900)
      2905*  VALVE CONTROL METHOD - AUTOMATIC/MANUAL (NAME X(8) IN 29
             00)
      2906*  PIPE/VALVE DIMENSIONS - IN (NAME X(8) IN 2900)
      2907*  PIPE/VALVE SHELL CONSTRUCTION MATERIAL GENERIC TYPE (NAM
             E X(8) IN 2900)
      2908*  PIPE/VALVE SHELL CONSTRUCTION MATERIAL SPECIFIC TYPE (NA
             ME X(8) IN 2900)
      2909*  PIPE/VALVE SHELL CONSTRUCTION MATERIAL COMMON NAME (NAME
              X(8) IN 2900)
      2910*  PIPE/VALVE LINER CONSTRUCTION MATERIAL GENERIC TYPE (NAM
             E X(8) IN 2900)
      2911*  PIPE/VALVE LINER CONSTRUCTION MATERIAL SPECIFIC TYPE (NA
             ME X(8) IN 2900)
      2912*  PIPE/VALVE LINER CONSTRUCTION MATERIAL COMMON NAME (NAME
              X(8) IN 2900)
  3000*  FGD SPARE CAPACITY INDICES (RG IN 800)
    3001*  SCRUBBER SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN 3000)

    3002*  ABSORBER SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN 3000)

    3003*  MIST ELIMINATOR SPARE CAPACITY - % (DECIMAL NUMBER 999.9 I
           N 3000)
    3004*  REHEATER SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN 3000)

    3005*  FAN SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN 3000)
    3006*  BALL MILL SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN 3000
           )
    3007*  SLAKER SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN 3000)
    3008*  EFFLUENT HOLD TANK SPARE CAPACITY - % (DECIMAL NUMBER 999.
           9 IN 3000)
    3009*  RECIRCULATION PUMP SPARE CAPACITY - % (DECIMAL NUMBER 999.
           9 IN 3000)
    3010*  THICKENER SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN 3000
           )
```

(continued)

```
   3011*  VACUUM FILTER SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN
          3000)
   3012*  CENTRIFUGE SPARE CAPACITY - % (DECIMAL NUMBER 999.9 IN 300
          0)
 3100*  FGD SPARE COMPONENT INDICES (RG IN 800)
   3101*  SCRUBBER SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9 IN 31
          00)
   3102*  ABSORBER SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9 IN 31
          00)
   3103*  MIST ELIMINATOR SPARE COMPONENT INDEX (DECIMAL NUMBER 999.
          9 IN 3100)
   3104*  REHEATER SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9 IN 31
          00)
   3105*  FAN SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9 IN 3100)
   3106*  BALL MILL SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9 IN 3
          100)
   3107*  SLAKER SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9 IN 3100
          )
   3108*  EFFLUENT HOLD TANK SPARE COMPONENT INDEX (DECIMAL NUMBER 9
          99.9 IN 3100)
   3109*  RECIRCULATION PUMP SPARE COMPONENT INDEX (DECIMAL NUMBER 9
          99.9 IN 3100)
   3110*  THICKENER SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9 IN 3
          100)
   3111*  VACUUM FILTER SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9
          IN 3100)
   3112*  CENTRIFUGE SPARE COMPONENT INDEX (DECIMAL NUMBER 999.9 IN
          3100)
 3200*  PILOT PLANT (RG IN 800)
   3201*  PILOT PLANT UNIT NUMBER (NAME X(8) IN 3200)
   3202*  PILOT PLANT PARTICIPANTS (NAME X(8) IN 3200)
   3203*  PILOT PLANT PROCESS (NAME X(8) IN 3200)
   3204*  PILOT PLANT DESIGN (NAME X(8) IN 3200)
   3205*  PILOT PLANT SUPPLIER (NAME X(8) IN 3200)
   3206*  PILOT PLANT SERVICE DATE - YYMM (INTEGER NUMBER 9999 IN 32
          00)
   3207*  PILOT PLANT PERIOD OF OPERATION - MONTHS (INTEGER NUMBER 9
          99 IN 3200)
   3208*  PILOT PLANT GAS FEED (NAME X(8) IN 3200)
   3209*  PILOT PLANT EQUIVALENT SCRUBBED CAPACITY - MW (DECIMAL NUM
          BER 999.999 IN 3200)
   3210*  PILOT PLANT STATUS - ACTIVE/TERMINATED (NAME X(8) IN 3200)

 3300*  FGD ECONOMICS (RG IN 800)
   3301*  ECONOMICS TYPE - REPORTED/ADJUSTED/STANDARDIZED (NAME X(8)
          IN 3300)
   3302*  DIRECT CAPITAL COST - $ (MONEY $9(9).99 IN 3300)
   3303*  INDIRECT CAPITAL COST - $ (MONEY $9(9).99 IN 3300)
   3304*  OTHER CAPITAL CHARGES - $ (MONEY $9(9).99 IN 3300)
   3305*  CAPITAL COST YEAR (INTEGER NUMBER 9999 IN 3300)
   3306*  TOTAL CAPITAL COST - $ (MONEY $9(9).99 IN 3300)
   3307*  TOTAL $/KW (MONEY $9999.9 IN 3300)
```

(continued)

```
  3308*  DIRECT ANNUAL COST - $ (MONEY $9(9).99 IN 3300)
  3309*  OVERHEAD COST - $ (MONEY $9(9).99 IN 3300)
  3310*  FIXED CHARGES - $ (MONEY $9(9).99 IN 3300)
  3311*  TOTAL ANNUAL COST - $ (MONEY $9(9).99 IN 3300)
  3312*  ANNUAL COST YEAR (INTEGER NUMBER 9999 IN 3300)
  3313*  TOTAL MILLS/KWH (DECIMAL NUMBER 999.99 IN 3300)
  3314*  CAPACITY FACTOR - % (INTEGER NUMBER 999 IN 3300)
3400*  SYSTEM DEPENDABILITY PERFORMANCE (RG)
  3401*  PERFORMANCE DATE - YYMM (INTEGER NUMBER 9999 IN 3400)
  3402*  PERIOD - HR (INTEGER NUMBER 9999 IN 3400)
  3403*  BOILER - HR (INTEGER NUMBER 9999 IN 3400)
  3404*  UNIT CAPACITY FACTOR - % (DECIMAL NUMBER 999.9 IN 3400)
  3405*  UNIT AVAILABILITY - % (DECIMAL NUMBER 999.9 IN 3400)
  3410*  LOST GENERATION FACTOR - % (DECIMAL NUMBER 999.9 IN 3400)
  3411*  MEGAWATT-HOURS GENERATED (INTEGER NUMBER 9(7) IN 3400)
  3412*  PERFORMANCE LOAD DATE - YYMM (INTEGER NUMBER 9999 IN 3400)
  3440*  SYSTEM MODULE PERFORMANCE (RG IN 3400)
    3441*  MODULE PERFORMANCE DATE - YYMM (INTEGER NUMBER 9999 IN 344
           0)
    3443*  MODULE NUMBER (NAME X(8) IN 3440)
    3444*  SERVICE - HR (INTEGER NUMBER 9999 IN 3440)
    3445*  FORCED OUTAGE TIME - HR (INTEGER NUMBER 9999 IN 3440)
    3446*  SCHEDULED OUTAGE TIME - HR (INTEGER NUMBER 9999 IN 3440)
    3447*  MODULE AVAILABILITY - % (DECIMAL NUMBER 999.9 IN 3440)
    3448*  MODULE OPERABILITY - % (DECIMAL NUMBER 999.9 IN 3440)
    3449*  MODULE RELIABILITY - % (DECIMAL NUMBER 999.9 IN 3440)
    3450*  MODULE UTILIZATION - % (DECIMAL NUMBER 999.9 IN 3440)
    3451*  MODULE AVAILABLE TIME - HR (INTEGER NUMBER 9999 IN 3440)
  3460*  PROBLEMS/SOLUTIONS/COMMENTS (RG IN 3400)
    3461*  PROBLEM START DATE - YYMM (INTEGER NUMBER 9999 IN 3460)
    3462*  PROBLEM END DATE - YYMM (INTEGER NUMBER 9999 IN 3460)
    3463*  EQUIPMENT CODE (NAME X(8) IN 3460)
    3464*  PROBLEM CLASS (NAME X(8) IN 3460)
    3465*  PROBLEM CODE (NAME X(8) IN 3460)
    3470*  SOLUTION/DESCRIPTION (RG IN 3460)
      3471*  SOLUTION/DESCRIPTION SEQUENCE NUMBER (INTEGER NUMBER 99
             IN 3470)
      3472*  SOLUTION/DESCRIPTION NAME (TEXT X(8) IN 3470)
    3480*  PROBLEM MODULE (RG IN 3460)
      3481*  PROBLEM MODULE NUMBER (NAME X(8) IN 3480)
3900*  REMOVAL PERFORMANCE DATA (RG)
  3901*  REMOVAL PERFORMANCE DATE - YYMMDD (INTEGER NUMBER 9(6) IN 39
         00)
  3902*  REMOVAL PERFORMANCE DURATION (NAME X(8) IN 3900)
  3903*  PERFORMANCE MODULE NUMBER (NAME X(8) IN 3900)
  3904*  PERFORMANCE TESTING ORGANIZATION (NAME X(8) IN 3900)
  3905*  AVERAGE BOILER LOAD DURING TESTING - NET MW (NAME X(8) IN 39
         00)
  3906*  SO2 INLET CONCENTRATION - LB/HR (DECIMAL NUMBER 9(5).999 IN
         3900)
  3907*  SO2 INLET CONCENTRATION - PPM-DRY (DECIMAL NUMBER 9999.999 I
         N 3900)
```

(continued)

```
   3908*  SO2 INLET CONCENTRATION - LB/MM BTU (DECIMAL NUMBER 999.999
          IN 3900)
   3909*  SO2 OUTLET CONCENTRATION - LB/HR (DECIMAL NUMBER 999.999 IN
          3900)
   3910*  SO2 OUTLET CONCENTRATION - PPM-DRY (DECIMAL NUMBER 9999.999
          IN 3900)
   3911*  SO2 OUTLET CONCENTRATION - LB/MM BTU (DECIMAL NUMBER 999.999
          IN 3900)
   3912*  % SO2 REMOVAL (DECIMAL NUMBER 999.9 IN 3900)
   3913*  SO2 ANALYSIS METHOD (NAME X(8) IN 3900)
   3914*  SO2 POINT OF MEASUREMENT (NAME X(8) IN 3900)
   3915*  INSTRUMENT CERTIFICATION (NAME X(8) IN 3900)
   3916*  PART INLET CONCENTRATION - LB/HR (DECIMAL NUMBER 9(5).999 IN
          3900)
   3917*  PART INLET CONCENTRATION - GR/SCF-DRY (DECIMAL NUMBER 99.999
          IN 3900)
   3918*  PART INLET CONCENTRATION - LB/MM BTU (DECIMAL NUMBER 9(5).99
          9 IN 3900)
   3919*  PART OUTLET CONCENTRATION - LB/HR (DECIMAL NUMBER 999.999 IN
          3900)
   3920*  PART OUTLET CONCENTRATION - GR/SCF-DRY (DECIMAL NUMBER 99.99
          9 IN 3900)
   3921*  PART OUTLET CONCENTRATION - LB/MM BTU (DECIMAL NUMBER 9(5).9
          99 IN 3900)
   3922*  % PART REMOVAL (DECIMAL NUMBER 999.99 IN 3900)
   3923*  PART ANALYSIS METHOD (NAME X(8) IN 3900)
   3924*  PART POINT OF MEASUREMENT (NAME X(8) IN 3900)
   3925*  OPACITY - % (DECIMAL NUMBER 999.99 IN 3900)
   3926*  NOX INLET CONCENTRATION - LB/HR (DECIMAL NUMBER 9(5).999 IN
          3900)
   3927*  NOX INLET CONCENTRATION - PPM-DRY (DECIMAL NUMBER 9999.999 I
          N 3900)
   3928*  NOX INLET CONCENTRATION - LB/MM BTU (DECIMAL NUMBER 999.999
          IN 3900)
   3929*  NOX OUTLET CONCENTRATION - LB/HR (DECIMAL NUMBER 999.999 IN
          3900)
   3930*  NOX OUTLET CONCENTRATION - PPM-DRY (DECIMAL NUMBER 9999.999
          IN 3900)
   3931*  NOX OUTLET CONCENTRATION - LB/MM BTU (DECIMAL NUMBER 999.999
          IN 3900)
   3941*  % NOX REMOVAL (DECIMAL NUMBER 999.99 IN 3900)
   3942*  NOX ANALYSIS METHOD (NAME X(8) IN 3900)
   3943*  NOX POINT OF MEASUREMENT (NAME X(8) IN 3900)
4000*  FOOTNOTE - ABSTRACT INFORMATION (RG)
   4001*  LITERAL CODE (INTEGER NUMBER 9999 IN 4000)
   4002*  LITERAL DATE - YYMM (INTEGER NUMBER 9999 IN 4000)
   4003*  LITERAL SEQUENCE NUMBER (INTEGER NUMBER 9999 IN 4000)
   4004*  LITERAL DATA (TEXT X(8) IN 4000)
   4005*  LITERAL DATA FIELD NUMBER (INTEGER NUMBER 9999 IN 4000)
```

(continued)

3.0 DATA BASE EXECUTION

3.1 NCC ACCESS

The first step in accessing the FGDIS is to log into the Univac system at NCC. To accomplish this a telephone and coupler modem are required if not using a terminal that is wired directly to the system (as are the ones located on-site at the NCC center). Also required is a terminal that is compatible with the Univac 1100 system. Any terminal, hard copy or cathode ray tube (CRT), that emulates a teletype at 30 or 120 bits per second can be supported. The terminal must use the ASCII character set and be set in the half duplex mode.

Some known compatible terminals are:

DCT 500

Anderson Jacobson 63x, 83x
Hazeltine 1000, 2000 (CRT)
Hewlett-Packard 2622A
Tektronix 401x, 4051
Teletype 33, 35, 37, 38 (ASR/KSR)
Texas Instrument 7xx, 770/2

These terminals are not the only compatible terminals available, nor is this a list of recommended terminals. There are over 100 manufacturers of hard-copy and CRT terminals, and as long as the terminal can emulate a teletype, it can be supported. DCT 1000's and Uniscope 100's are only supported over dedicated circuits in synchronous mode.

Access to the NCC system for both 300 baud and 1200 baud users is available through a nationwide telephone communications system (TYMNET) that offers local dial numbers in over 100 cities, as well as WATS service to those for which local numbers are not available. See Table 2 for a complete listing of the available numbers. Users who must use the WATS numbers are requested to call NCC Communication Control at the number listed below so that candidates for local dial numbers can be identified.

All telecommunication problems (e.g., busy signals, ring-no-answer, line drops) should be reported to NCC Communication Control at (919)541-4506 or FTS 629-4506. Appendix B provides a complete listing of TYMNET diagnostic messages that may be encountered and their meaning.

Assistance in utilizing the NCC facilities (e.g., general assistance, consultation, problem diagnosis) can be obtained by calling the NCC Users Services Support group at (919) 541-3649 or FTS 629-3649. Assistance is available from 8:00 a.m. to 4:30 p.m., Eastern Time, Monday through Friday. For information on the availability of the Univac system, the following numbers can be called to access a system status recording that is maintained by the NCC staff; (919) 541-2226 (2227) or FTS 629-2226 (2227).

3.1.1 Computer Log-on

The general log-on procedure to initiate a session on the Univac is as follows:

1. Turn on the power to the terminal and the acoustic coupler (if the terminal being used has an internal modem an acoustic coupler will not be necessary, e.g., Teletype Model 43).

TABLE 2. NCC ACCESS TELEPHONE NUMBERS

State	City	Telephone
Albama	Birmingham	205/942-4141
	Birmingham	205/942-1015 (1200)
	Huntsville	205/533-5137
	Mobile	205/432-3382 (1200)
	Montgomery	205/834-3410
Arizona	Phoenix	602/249-3862 (1200)
	Phoenix	602/249-9261
	Tucson	602/747-4097 (1200)
	Tucson	602/790-0764
Arkansas	Ft. Smith	501/782-3210 (1200)
	Jonesboro	501/932-6886 (1200)
	Little Rock	501/376-3768 (1200)
	Little Rock	501/372-5780
	Springdale	501/756-2201 (1200)
California	Alhambra	213/572-0999
	Antioch	415/757-6855
	Arcadia	213/574-7636
	Burlingame	415/348-4992
	El Segundo	213/640-1281 (1200)
	El Segundo	213/640-1570
	Fresno	209/445-0911
	Hayward	415/785-3431
	Long Beach	213/435-7088 (1200)
	Los Angeles	213/683-0451
	Los Angeles	213/626-0365 (1200)
	Los Angeles	213/629-1561
	Los Angeles	213/629-3451
	Los Angeles	213/623-8500 (1200)
	Marina Del Rey	213/821-2257
	Mission Hills	213/365-2013
	Modesto	209/578-4236
	Mountain View	415/961-7971
	Mountain View	415/941-8450
	Mountain View	415/949-0330 (1200)
	Newport Beach	714/540-0951 (1200)
	Newport Beach	714/540-9560
	Northridge	213/998-4872 (1200)
	Norwalk	213/865-2066 (1200)
	Oakland	415/836-8900 (1200)
	Oakland	415/836-8700
	Palo Alto	415/856-9080
	Pasadena	213/577-8722 (1200)
	Riverside/Colton	714/825-9372
	Riverside/Colton	714/824-8170 (1200)

(continued)

TABLE 2 (continued)

State	City	Telephone
California (continued)	Sacramento	916/448-8151 (1200)
	Sacramento	916/441-6550
	Salinas	408/443-4333
	San Clemente	714/498-3130
	San Diego	714/291-8700
	San Diego	714/293-3590 (1200)
	San Francisco	415/986-8200
	San Francisco	415/397-4300 (1200)
	San Francisco	415/788-7955 (1200)
	San Jose/Cupertino	408/446-7001 (1200)
	San Jose/Cupertino	408/446-7309 (1200)
	San Jose/Cupertino	408/446-1470
	San Pedro	213/830-0775
	Santa Barbara	805/687-6119
	Santa Cruz	408/429-9572 (1200)
	Santa Rosa	707/546-6776 (1200)
	Santa Rosa	707/546-1050
	Van Nuys	213/986-9503
	Ventura/Oxnard	805/486-4536 (1200)
	Ventura/Oxnard	805/487-0482
	Vista	714/727-6011
	West Covina	213/331-3954
Colorado	Colorado Springs	303/633-9599 (1200)
	Colorado Springs	303/475-2121
	Denver	303/572-1107 (1200)
	Denver	303/825-0635 (1200)
	Denver	303/573-0177
	Denver	303/573-9981
Connecticut	Bridgeport	203/579-7820
	Danbury	203/743-1340
	Danbury	203/743-1650 (1200)
	Darien	203/655-7951 (1200)
	Darien	203/655-8931
	Fairfield/Bridgeport	203/333-4926 (1200)
	Hartford	203/568-2610
	Hartford	203/569-3643 (1200)
	New Haven	203/787-1702 (1200)
	New Haven	203/789-0579
	Waterbury	203/755-1153
D.C.	Washington	703/841-9330 (1200)
	Washington	703/841-0200
	Washington	703/841-9560
	Washington	703/734-8370 (1200)

(continued)

TABLE 2 (continued)

State	City	Telephone
Delaware	Wilmington	302/658-5261
	Wilmington	302/658-8611 (1200)
Florida	Daytona Beach	904/252-4481
	Ft. Lauderdale	305/467-7550
	Ft. Lauderdale	305/467-3807 (1200)
	Jacksonville	904/721-8100
	Miami	305/374-7120
	Miami	305/358-7271 (1200)
	Orlando	305/859-7670 (1200)
	Orlando	305/851-3530
	Pensacola	904/434-0134
	Sarasota	813/365-3526 (1200)
	St. Petersburg	813/535-6441
	Tampa	813/977-8032
	Tampa	813/977-3891 (1200)
	W. Palm Beach	305/622-2871
Georgia	Atlanta	404/659-6670
	Atlanta	404/581-0619 (1200)
	Atlanta	404/659-2910
	Savannah	912/352-7259
Idaho	Boise	208/344-4311 (1200)
	Boise	208/343-4851
Illinois	Chicago	312/368-4700
	Chicago	312/641-1630 (1200)
	Chicago	312/372-0391 (1200)
	Chicago	312/368-4607
	Chicago	312/346-4961
	Freeport	815/233-5585
	Joliet	815/723-9854 (1200)
	Peoria	309/673-2156
	Rockford	815/398-6090
	Springfield	217/753-7900 (1200)
	Springfield	217/753-7905
Indiana	Evansville	812/423-6885
	Ft. Wayne	219/424-5162
	Highland	219/836-5452
	Indianapolis	317/926-1253 (1200)
	Indianapolis	317/257-3461
	Marion	317/662-0091
	Merrillville	219/769-7254
	South Bend	219/233-4163

(continued)

TABLE 2 (continued)

State	City	Telephone
Iowa	Cedar Rapids	319/363-2482
	Des Moines	515/288-6650
	Iowa City	319/354-7371
	Waterloo	319/233-9227 (1200)
Kansas	Shawnee Mission	913/677-2833
	Shawnee Mission	913/677-0707 (1200)
	Topeka	913/233-0690
	Wichita	316/265-1241
	Wichita	316/264-7386 (1200)
Kentucky	Lexington	606/253-3463
	Lexington	606/253-3498 (1200)
	Louisville	502/361-2645 (1200)
	Louisville	502/361-3881
Louisiana	Baton Rouge	504/292-4050
	Baton Rouge	504/292-2650 (1200)
	Lafayette	318/235-3501
	New Orleans	504/586-1071
	New Orleans	504/524-4371 (1200)
	Shreveport	318/688-4666 (1200)
Maryland	Baltimore	301/547-8100
	Baltimore	301/244-8959 (1200)
Masachusetts	Boston	617/482-1854 (1200)
	Boston	617/482-5622
	Boston	617/482-4677
	Boston	617/482-3386 (1200)
	Springfield	413/781-6830
	Springfield	413/781-0145 (1200)
	Worcester	617/755-5601 (1200)
	Worcester	617/754-9451
Michigan	Ann Arbor	313/662-8282 (1200)
	Ann Arbor	313/665-2627
	Detroit	313/963-3388
	Detroit	313/963-8880 (1200)
	Detroit	313/963-2353 (1200)
	Flint	313/732-7303 (1200)
	Grand Rapids	616/456-9092 (1200)
	Grand Rapids	616/459-5069
	Jackson	517/787-9461
	Kalamazoo	616/385-3150
	Lansing	517/487-2040

(continued)

TABLE 2 (continued)

State	City	Telephone
Michigan (continued)	Manistee	616/723-8760
	Plymouth	313/459-8100 (1200)
	Plymouth	313/459-8900
	Southfield	313/569-8350
	St. Joseph	616/429-2568
	Traverse City	616/946-0002
Minnesota	Mankato	507/625-1684 (1200)
	Minneapolis	612/339-5200
	Minneapolis	612/339-2415 (1200)
	Rochester	507/282-3741 (1200)
Mississippi	Jackson	601/969-5141 (1200)
	Jackson	601/944-0860
	Pascagoula	601/769-6502
	Pascagoula	601/769-6673 (1200)
Missouri	Bridgeton	314/731-2304
	Columbia	314/875-1150
	Jefferson City	314/634-3273 (1200)
	Joplin	417/782-3037 (1200)
	Kansas City	913/677-2833
	Kansas City	913/677-0707 (1200)
	Springfield	417/831-0566 (1200)
	St. Louis	314/421-5110
	St. Louis	314/621-4660 (1200)
	St. Joseph	816/232-0624 (1200)
Montana	Butte	406/494-2998 (1200)
Nebraska	Omaha	402/392-2970
Nevada	Las Vegas	702/293-0300
	Reno/Carson City	702/883-6546 (1200)
	Reno/Carson City	702/882-7810
New Hampshire	Manchester	603/669-0493
	Nashua	603/889-8618
New Jersey	Englewood Cliffs	201/894-8250
	Lyndhurst	201/460-0100
	Lyndhurst	201/460-0180 (1200)
	Moorestown	609/235-3761
	Morristown	201/267-3997 (1200)
	Newark/Union	201/483-5937
	Newark/Union	201/483-4878 (1200)
	Piscataway	201/981-1900

(continued)

TABLE 2 (continued)

State	City	Telephone
New Jersey (continued)	Princeton	609/452-8970
	Princeton	609/452-8560 (1200)
	Wayne	201/785-4480
New Mexico	Albuquerque	505/843-6301 (1200)
New York	Albany	518/463-3111
	Albany	518/434-2633 (1200)
	Buffalo	716/856-1400
	Buffalo	716/847-0500 (1200)
	Corning	607/936-4151 (1200)
	Corning	607/962-5071
	Elmira	607/737-9010 (1200)
	Hempstead L.I.	516/794-3390
	Huntington L.I.	516/673-5780
	New York	212/685-4414
	New York	212/532-0437
	New York	212/344-3392
	New York	212/668-0130 (1200)
	New York	212/344-7445
	New York	212/683-0131
	New York	212/532-8101 (1200)
	Niagara Falls	716/285-3114 (1200)
	Niagara Falls	716/285-6691
	Rochester	716/248-8000
	Rochester	716/248-8350 (1200)
	Syracuse	315/437-1117 (1200)
	Syracuse	315/437-7111
	White Plains	914/694-8960 (1200)
	White Plains	914/694-9361
North Carolina	Asheville	704/255-0021 (1200)
	Charlotte	704/376-2544 (1200)
	Charlotte	704/376-2545
	Durham	919/549-8910 (1200)
	Durham	919/549-0441
	Greensboro	919/275-8231 (1200)
	Greensboro	919/379-0034
	Raleigh	919/832-6592 (1200)
	Research Triangle Park	919/549-9100
	Research Triangle Park	919/549-9100 (1200)
	Winston-Salem	919/725-1414
	Winston-Salem	919/725-9252 (1200)
Ohio	Akron	216/535-1861
	Cincinnati	513/791-5311 (1200)
	Cincinnati	513/891-7211

(continued)

TABLE 2 (continued)

State	City	Telephone
Ohio (continued)	Cleveland	216/781-7050
	Cleveland	216/861-5383 (1200)
	Columbus	614/421-1650 (1200)
	Columbus	614/421-7270
	Dayton	513/223-3847
	Dayton	513/461-6400 (1200)
	Marysville	513/642-2015 (1200)
	Toledo	419/255-2946 (1200)
	Toledo	419/243-3144
	Youngstown	216/744-5326 (1200)
Oklahoma	Oklahoma City	405/947-0561
	Oklahoma City	405/949-0125 (1200)
	Tulsa	918/663-2220
	Tulsa	918/665-2750 (1200)
Oregon	Portland	503/231-4050
	Portland	503/231-4077 (1200)
Pennsylvania	Allentown	215/433-6131
	Allentown	215/432-5926 (1200)
	Altoona	814/946-8888 (1200)
	Erie	814/453-7161
	Harrisburgh	717/236-1190
	Philadelphia	215/567-1381 (1200)
	Philadelphia	215/561-6120
	Pittsburgh	412/261-4151 (1200)
	Pittsburgh	412/765-1320
	Valley Forge	215/666-0930 (1200)
	Valley Forge	215/666-9190
Rhode Island	Providence	401/274-5783
	Providence	401/831-5566 (1200)
South Carolina	Columbia	803/252-0840
	Greenville	803/271-2418
Tennessee	Chattanooga	615/756-0561 (1200)
	Chattanooga	615/756-5856
	Knoxville	615/637-3118
	Knoxville	615/523-7458 (1200)
	Memphis	901/529-0183 (1200)
	Memphis	901/529-0170
	Nashville	615/361-7566 (1200)
	Nashville	615/367-9382

(continued)

TABLE 2 (continued)

State	City	Telephone
Texas	Austin	512/444-5800 (1200)
	Baytown	713/427-5856
	Beaumont	713/832-2589
	Corpus Christi	512/882-3641
	Dallas	214/638-8888
	Dallas	214/688-1444 (1200)
	El Paso	915/544-9590
	El Paso	915/532-1936 (1200)
	Ft. Worth	214/263-4581
	Ft. Worth	214/263-0278 (1200)
	Houston	713/977-4080
	Houston	713/785-4411
	Houston	713/780-7496 (1200)
	Houston	713/977-7671 (1200)
	Houston	713/780-7390
	Longview	214/758-1756
	Lubbock	806/762-0136
	Midland	915/683-9833 (1200)
	Midland	915/683-5645
	Odessa	915/563-3745
	San Antonio	512/699-9627 (1200)
	San Antonio	512/696-4002
Utah	Salt Lake City	801/582-8972
	Salt Lake City	801/582-6060 (1200)
Vermont	Burlington	802/864-0054 (1200)
Virginia	Newport News	804/596-5754
	Norfolk	804/625-8301 (1200)
	Richmond	804/788-4604 (1200)
	Richmond	804/649-3050
Washington	Enumclaw	206/825-6909
	Olympia	206/943-4190
	Richland	509/375-3367 (1200)
	Richland	509/375-1975
	Seattle	206/625-9937 (1200)
	Seattle	206/625-9900
	Spokane	509/838-8226 (1200)
	Tacoma	206/952-6800
West Virginia	Charleston	304/345-2908 (1200)
	Huntington	304/522-6261

(continued)

TABLE 2 (continued)

State	City	Telephone
Wisconsin	Appleton	414/734-9940
	Eau Claire	715/834-7863
	Green Bay	414/468-6808 (1200)
	Madison	608/221-0891 (1200)
	Madison	608/221-4211
	Milwaukee	414/257-3482
	Milwaukee	414/257-1703 (1200)
	Oshkosh	414/235-4594

WATS (800 Area Code) Numbers

300 Baud	800/527-1800 (except in California) 800/648-7910 (only in California)
1200 Baud	800/527-5861 (except in Texas) 800/442-5000 (only in Texas)

Note: Users are requested to use the WATS numbers only when local dial service is not available.

2. Dial the TYMNET telephone number available in your area.

3. After the telephone has rung at least once, a high-pitched tone will indicate that the proper connection to the communications network has been made.

4. When the tone is heard, couple the terminal to the telephone line by placing the phone handset firmly into the acoustic coupler, orienting it as marked on the coupler (for terminals not requiring an acoustic coupler, there will be a data button that should be depressed, after which the phone can be hung-up).

5. The following message will appear at your terminal (although it will appear garbled at speeds other than 300 or 1200 baud):

```
PLEASE TYPE YOUR TERMINAL IDENTIFIER
```

6. Type your terminal identifying character. This can be located in Table 3.

7. TYMNET will then display:

```
-XXXX-YYY-
PLEASE LOG IN:
```

(XXXX is a code for the TYMNET node to which you are connected, and YYY is the port on that node.)

Note: This message sent from TYMNET has no parity. If your terminal is checking for parity, this message may be garbled.

Respond by typing UNIEPA1, followed by a carriage return.*

* You may need/want to enter additional information, in the form of one or more of the following control characters before typing UNIEPA1:

CONTROL H	Suppresses TYMNET echoing of input characters. This affects only the input UNIEPA1 - once connected to the UNIVAC, input will not be echoed even without typing CONTROL H.

TABLE 3. TERMINAL IDENTIFIERS

Terminal	ID^a
ADDS	
580, 620, 680, 880, 980	A
Anderson Jacobson	[Cr]
330	
830, 832	A
630	E
860^b	A
Ann Arbor Terminals	
Design III, 200	A
Beehive Medical Electronics	
Mini Bee 1, 2, 4	A
Super Bee 2, 3	A
I-211, M-501, R-211	A
Bell System	
Dataspeed 40/2	
KD	A
KDP	G
Computer Devices	
1030	E
1132, 1201, 1202, 1203, 1204, 1205, 1206	A
Computek	
200, 300	A
Conrac	
401, 480	A
Control Data	
713	A
Computer Transceiver Systems	
Execuport	E
DEC	
GT40, LA34, LA36, LA38, LA120^b, LS120^b, VT05, VT50, VT100, VT132	A
Datamedia	
1500, 2000, 2100, 2500	A
Datapoint	
1100, 3000, 3300	A
Delta Data	
5000, 5100, 5200	A
Digi-Log	
33, 209, 300	A
General Electric Terminet	
300, 1200	G
Gen-Com	
300	A
Hazeltine	
1200, 2000	A
Hewlett-Packard	
2615, 2616, 262X Series, 263X Series, 264X Series, 7220A^b	A
Hydra	
Model B	I
IBM	
2741	P[Cr]
Interdata	
Carousel 300	E
Incoterm	
SPD 10/20, 20/20, 900	A
Infoton	
Vistar	A
ITT	
3501 Asciscope	A
Lear Siegler	
7700, ADM-1, ADM-2, ADM-3, ADM-31	A
LogAbax Informatique	
LX180	I
LX 1010^b	A
HP	
2400^b	I
Megadata	A
Memorex	
1240	G
NCR	
260	E
796	A
Omron	
8525	A
Ontel	
4000	A
Perkin-Elmer	
1200, 1250	A
Research	
Teleray 3300, 3311, 3712	A
Raytheon	
PTS-100	A
Singer	
30	E
Scientific Measurement Systems	
1440	A
Tally	
1612^b	A
Tec	
400 Series, 1440	A
Tektronix	
4012, 4013, 4014, 4023, 4025	A
Teletype	
33, 35	D
38	B
43	A
Texas Instruments	
720, 725, 733, 735, 743, 745, 763, 765, 771^b, 820^b	A
Texas Scientific	
Entelkon 10	A
Typagraph	
DP-30	C
Tymshare	
100, 110, 212, 213	E
200	D
310, 311	C
125, 126, 225, 315, 316, 325, 350^b, 420, 425^b, 430, 440W, 444^b, 470^b, 550^b, 1100^b	A
Wang Laboratories	
220 OB	A
Westinghouse	
1600, 1620	A
Xerox	
BC100, BC200	A

[a] The symbol [Cr] represents a carriage return.

[b] During log in, enter Control R immediately before typing your user name.

CONTROL P	Provides/ensures that data received at your terminal will have even parity. Although UNIVAC output will have even parity, TYMNET messages normally do not.
CONTROL X	Tells TYMNET to control the flow of data from your terminal (towards the UNIVAC) with XON and XOFF to prevent input data loss. This is normally necessary if you are inputting from paper tape, cassette, or internal buffer.
CONTROL R	Tells TYMNET that your terminal will be controlling the flow of data to your terminal (from the UNIVAC) with XON and XOFF to prevent output data loss.

8. TYMNET will prompt for the password with:

```
PASSWORD:
```

Respond by typing NCC, followed by a carriage return. (Passwords are not echoed.)

9. Once the connection is made to the UNIVAC you will receive:

P### (### is a code for the UNIVAC port) and:

```
UNIV IS ON LINE
```

10. After receiving the message UNIV IS ON LINE, enter:

UNIVAC (followed by a carriage return)

The characters UNIVAC must be even parity, uppercase ASCII to initiate a session on the UNIVAC.

11. The UNIVAC will respond with:

```
ENTER USERID/PASSWORD:
```

A valid USERID and PASSWORD should be entered, separated by a slash (followed by a carriage return).

12. The UNIVAC will respond with:

```
*DESTROY USERID/PASSWORD ENTRY
*UNIVAC 1100 OPERATING SYSTEM LEV. XXXXXX*
```

possibly followed by some other log-on information.

13. Enter the following:

```
@@TTY∆C, [back space]
```

The [back space] refers to depressing the back space key. This command will enable the user to use the back space key to correct typing errors. Normal response to this will be:

```
-@@COMPLETE
```

14. Enter the following (if using a CRT terminal this step should be ignored):

```
@@TTY∆W,132
```

This will instruct the computer that a terminal is being used that is capable of handling 132 character lines. The normal response to this will be:

```
-@@COMPLETE
```

15. Enter a valid @RUN statement, which consists of the following:

```
@RUN∆[RUNID],[ACCOUNT NUMBER],FGD
```

Note: The RUNID is a user supplied value that should consist of a two digit bin number immediately followed by the user's initials. The bin number should correspond to the NCC bin to which any output that might be printed at the NCC should be directed (i.e., an EPA Region IV user would select the bin assigned to Region IV). See Section 4.1 for further information and a listing of EPA regional office bin numbers.

16. When an acceptable run has been established, the response will be:

```
DATE-------- TIME--------
***  NEWS CURRENT AS OF (TIME----) ON (DATE----) ***
```

17. At this point, you are now logged into the Univac 1100 system. The computer will provide the character ">" for input solicitation.

A sample runstream is as follows:

```
please type your terminal identifierA      *DESTROY USERID/PASSWORD ENTRY
-1071-051-                                 *UNIVAC 1100 OPERATING SYSTEM  LEV. 36R2B-80-27E(RSI)*
please log in:UNIEPA1
                                           >@@TTY C,
PASSWORD:                                  -@@COMPLETE
████████████████                           >@@TTY W,132
P 34                                       -@@COMPLETE
UNIV IS ON LINE                            >@RUN BOABC,ACCOUNT #,FGD
UNIVAC                                     DATE: 041381      TIME: 125038
███████████████   ENTER USERID/PASSWORD:   ***  NEWS CURRENT AS OF 11:14:18 ON 04/06/81    ***
                                           >
```

3.1.2 Computer Log-Off

The following procedure should be followed to terminate a session on the Univac 1100:

1. After the run is complete and the user wishes to terminate, type @FIN.
2. Some computer log-off information will be printed, followed by *TERMINAL INACTIVE*. After this is received, type @@TERM to terminate the terminal.

   After a UNIVAC @@TERM, TYMNET will prompt you to log in again. At this point, you may initiate a new UNIVAC session or you may simply hang up.

3.2 SYSTEM 2000 EXECUTION/TERMINATION

Once an active run has been initiated, the next step is to access the data base by executing SYSTEM 2000. This can be accomplished with the following command:

```
@ADD FGDIS.RUN
```

This command will initiate execution of SYSTEM 2000 and assign the FGDIS to the run. The normal response will be:

```
DATE----- TIME----- BEGIN SYSTEM 2000 VERSION 2.80D
---
-556-ASSIGNED...FGDIS (followed by the date and time that
the data base was last updated)
---
>
```

At this point, the data base is ready for use and the various Immediate Access or Report Writer features can be initiated.

When all queries have been satisfied and the user wishes to terminate use of the data base, the following command should be entered:

```
---
>EXIT:
```

The normal response to this will be:

```
DATE----- TIME----- END SYSTEM 2000 VERSION 2.80D
```

After receipt of the computer prompter (>), normal computer log-off procedures can be initiated (see Section 3.1.2).

3.3 IMMEDIATE ACCESS FEATURES

The Immediate Access feature of SYSTEM 2000 provides the data base user with various commands that can be used to retrieve and manipulate data that are stored within the assigned data base. The commands range from ones that are very simple and general to those that become more complex and specific. The commands generally take the form of PRINT <something>, or PRINT or LIST <something> WHERE <certain conditions exist>. Of these, the one using the WHERE clause to qualify certain portions of the data base for possible retrieval is most often used and can be a powerful tool when used in conjunction with a strong knowledge of the data base structure. The following sections provide a description of the structure and use of the retrieval commands available. It should be noted that all commands within SYSTEM 2000 are followed by a colon (:).

3.3.1 DESCRIBE Command

The purpose of the DESCRIBE Command is to retrieve a copy of the data base definition or a portion of a copy.

Format

(1) DESCRIBE:

(2) DESCRIBE <component number>:

(3) DESCRIBE <component number> THROUGH <component number>:

(4) DESCRIBE <component number> THRU <component number>:

The first option listed above produces a complete copy of the data base definition, inclusive of each repeating group and all components therein. Options two through four are used to retrieve descriptions of single or multiple components. If the component number referenced in the command is not present in the data base, an error diagnostic will result.

The first option produces, in addition to the component description, four lines of header information, as follows:

```
SYSTEM VERSION NUMBER <n>
DATA BASE NAME IS <data base name>
DEFINITION NUMBER <n>
DATA BASE CYCLE NUMBER <n>
```

The version number of SYSTEM 2000 used to create the data base and the name of the data base are given first. The current Definition and Data Base Cycle Number are then output. When the definition is first created and data is first loaded, these last two numbers are set to one (1). If the definition or the data are modified, the Definition and Data Base Cycle Numbers are incremented appropriately.

3.3.2 TALLY Command

The purpose of the TALLY Command is to provide the user with statistical information about the unique values that are to be found within a specified element(s) of the data base.

Format

(1) TALLY <element list>:

(2) TALLY/EACH/<element list>:

(3) TALLY/ALL/<element list>:

where: <element list> = one or more element names or numbers separated by commas

There are two basic TALLY options -- TALLY/EACH/<element list> and TALLY/ALL/<element list>. EACH and ALL are both format statements, germaine only to the TALLY command. EACH is the default condition and is assumed if neither EACH nor ALL is used in the command (as in the first format).

The TALLY/EACH/ command produces output that provides the name of the element, a listing of each unique value stored for that element along with its frequency of occurrence, and a summary section which gives the total number of unique values and the total number of data values stored for the element.

A sample output is as follows:

```
***********************
 ELEMENT-     PLANT EPA REGION
***********************
FREQUENCY   VALUE
-----------------------
        2      1
        4      2
       26      3
       52      4
       43      5
       42      6
       15      7
       44      8
       23      9
        4     10
-----------------------
       10 UNIQUE VALUES
-----------------------
      255 OCCURRENCES
-----------------------
```

If the command had instead been TALLY/ALL/ for the same element, the result would have had the following format:

```
***********************
 ELEMENT-     PLANT EPA REGION
***********************
 MINIMUM-      1
-----------------------
 MAXIMUM-     10
-----------------------
       10 UNIQUE VALUES
-----------------------
      255 OCCURRENCES
-----------------------
```

The difference in output between the two is that with the TALLY/EACH/ command, each unique value for the specified element is output along with the frequency of occurrence for that unique value; whereas, with the TALLY/ALL/ command, the unique value list is replaced with the minimum and maximum unique values only.

If more than one element is specified in the element list, the reports for each will be output, as just shown in the examples, one after the other in the order specified.

The SINGLE SPACE, DOUBLE SPACE format statements, specified in a previous PRINT or LIST command, affect the output format of this command.

Restrictions

(1) A maximum of 100 elements may be included in the <element list> of one TALLY command.

3.3.3 PRINT Command

The purpose of the PRINT command is to retrieve data specified in the <print clause> from the data base and output the data in a simple sequential list.

Format

(1) PRINT <print clause>:

(2) PRINT <print clause>, <ordering clause> WHERE <conditions exist>:

where: <print clause> = <option list>, <by clause(s)>, or <object list(s)>

<ordering clause> = an optional portion of the command used to order the output (see Section 3.3.7)

<conditions exist> = series of legal WHERE clause conditions

<option list> = one or more format option statements separated by commas, the entire list set off by slashes (see Section 3.3.4)

<by clause(s)> = one or more BY clauses separated by commas, each one having its own object list (see Section 3.3.9)

<object list(s)> = element references (name or number) or repeating group references

The PRINT command produces a simple sequential list of output as shown in the examples included in this section. As can be seen by the formats specified above, the PRINT command has two basic forms; one with and one without a WHERE clause. The first one shown above, the one without a WHERE clause, results in output in tree order. That is to say, the data output will reflect the hierarchical structure of the data base, as illustrated in the FGDIS structure diagram (Section 2.1).

With no formatting options specified, i.e., all formatting options are in their default state, the output from a PRINT command is consistent with the following example:

```
---
>PRINT C5,C7,C8,C102,FUEL TYPE:
  5* ALABAMA ELECTRIC COOP
  7* TOMBIGBEE
  8* 2
    102* PULVERIZED COAL
      201* COAL
  5* ALABAMA ELECTRIC COOP
  7* TOMBIGBEE
  8* 3
    102* PULVERIZED COAL
      201* COAL
  5* MONONGAHELA POWER
  7* PLEASANTS
  8* 1
    102* PULVERIZED COAL
      201* COAL
```

The example shows the component name and "C-number" format and also illustrates several characteristics of standard output format (changeable by the option list):

(1) The element stub is associated with the element values. The stub consists of the element number or name and the system separator.

(2) Hierarchical level differences are indicated by a two-space indention between levels.

(3) The system double spaces before data sets when printing repeating groups, or when the GROUP format option has been invoked prior to printing elements.

If the object list contains a repeating group, the associated output will contain the contents of every data set identified by that repeating group <u>and</u> all of its descendant data sets. Obviously, a massive amount of output can accompany such a command and any example given at this point would, by necessity, underplay the extent of the output.

When the command includes a WHERE clause, the WHERE clause is processed first so that only that portion of the data base which qualifies for the specified conditions will be considered for output. The WHERE clause will be discussed further in Section 3.3.10; however an example is as follows:

```
---
>PRINT C5,C7,C8,C201 WHERE C5 EQ CINCINNATI GAS & ELECTRIC:
  5* CINCINNATI GAS & ELECTRIC
  7* EAST BEND
  8* 2
     201* COAL
  5* CINCINNATI GAS & ELECTRIC
  7* EAST BEND
  8* 1
     201* COAL
```

The following collection of examples attempts to illustrate at least one of each type of PRINT command. The stress in these examples is placed on the <print clause> and not on the WHERE clause.

(1) PRINT <object list>:

```
PRINT C5,C7,C8:
PRINT C803,MAX C810:
PRINT BOILER SUPPLIER,FUEL TYPE:
PRINT(C22 - C23):
```

(2) PRINT/<option list>/:

```
PRINT/REPEAT SUPPRESS,NULL,BLOCK,NAME/:
PRINT/DOUBLE SPACE,NUMBER/:
PRINT/GROUP,STUB SUPPRESS/:
```

(3) PRINT/<option list>/<object list>:

```
PRINT/REPEAT/C5,C102,C201:
PRINT/STUB/SIGMA C19:
```

(4) PRINT <by phrase>,<object list>:

```
PRINT BY ENTRY,C1,COUNT C1004:
```

(5) PRINT <by phrase>,<object list>:

```
PRINT C1,C102,BY C100,MAX C213,MIN C213,AVG C213:
PRINT BY ENTRY,C1,COUNT C102,COUNT C201,BY C100,
  C102,C201:
```

(6) PRINT <print clause> WHERE <conditions exist>:

```
PRINT/REPEAT SUPPRESS/C5,C7,C8 WHERE C803 EQ LIME:
DITTO WHERE C809 EQ NEW:
```

(7) PRINT <print clause> WHERE <conditions exist>:

```
PRINT/REPEAT SUPPRESS/C5,C7,C8,OB C5,C7,C8 WHERE
  C809 EQ NEW:
```

NOTE: When the object list contains unrelated, disjoint elements or repeating groups and a WHERE clause is present, the <print clause> must contain a <by clause>, which is discussed in Section 3.3.9. Unrelated or disjoint components are defined as those not a part of the same repeating group family - e.g., element 1105, ABSORBER GENERIC TYPE is a member of the ABSORBER repeating group in the FGDIS definition and would be disjoint with element 1004, QUENCHER/PRESATURATOR TYPE, which is a member of the QUENCHER/PRESATURATOR repeating group.

3.3.4 Format Statements

The purpose of the Format Statements is to provide a means of modifying the format of retrieval output.

Format

(1) PRINT/<option list>/:
(2) PRINT/<option list>/<print clause>...:
(3) LIST/<option list>, TITLE <title specifications>/<list clause>...:

where: <option list> = one or more format option statements separated by commas

/ (slash) = the mandatory symbol used to set off the option list, when used

When a PRINT command contains an option list, the options within that list are active upon all data items specified in the command. Furthermore, if the option list contains format statements as discussed in this section, those format options are not only active on the associated data items, but upon all subsequent data items in following retrieval commands within that job, until superceded by replacement options.

The format options available to the user are as follows:

Format Statements

(1) SINGLE SPACE
DOUBLE SPACE

(2) INDENT
BLOCK

(3) NUMBER
NAME

(4) STUB
STUB SUPPRESS

(5) NULL SUPPRESS
NULL

(6) TREE
GROUP

(7) REPEAT
REPEAT SUPPRESS

(8) ZERO SUPPRESS
ZERO

The default condition of each option pair is the option on top. Some options are quite straightforward in their meaning; other option-pairs are more complex. A discussion of each follows.

(1) SINGLE SPACE - all output is single spaced.

DOUBLE SPACE - all output is double spaced.

(2) INDENT - each hierarchical level of output in ascending order (0,1,2, ... n) is indented by two spaces.

BLOCK - all output lines are left justified.

(3) NUMBER - the element stub (or element identifier) will appear as the component number followed by the system separator (*).

NAME - the stub will appear as the component name followed by the system separator.

(4) STUB - with stub in effect, the component stub will appear.

STUB SUPPRESS - the component stub will not appear.

(5) NULL SUPPRESS - When data sets are constructed by the user, they do not always contain all element values for that repeating group. When a defined element is unvalued in a data set, binary zeroes are actually stored in the tables where the element value is defined to be. With the NULL SUPPRESS option in effect, unvalued elements that, if valued, would have had output, will have no associated output (i.e., the element will not appear at all in the output).

NULL - when the NULL option is in effect, all elements that are requested in the PRINT command will have output whether valued or not. For unvalued elements, the element stub will print associated with the value -NULL-. This option will not affect LIST output.

(6) TREE - a request to print a repeating group will print that repeating group as well as all of its descendant data sets.

GROUP - a request to print a repeating group will print that group only and not the descendant data sets that might be associated with the selected repeating group.

(7) REPEAT - with this default condition in effect, a command to print several successive data sets that share a common ancestor will cause the common ancestor data set to print before each successive data set is output (i.e., the common ancestor data set will be repeated many times).

REPEAT SUPPRESS - the elements of a common ancestor data set will print only once when requesting a print of successive data sets that are joined to the common ancestor.

(8) ZERO SUPPRESS - this default condition causes -NULL- values to be treated as null when used in a user-defined function (e.g., mathematical expression). A null value in a user-defined function produces a null result.

ZERO - this option directs a null valued component to be treated as a zero when it is used in a user-defined function. This option applies to system functions (SUM, COUNT, AVG, MIN, MAX, SIGMA) only if the object of the system function is presented as an in-line function (Section 3.3.6).

Example:

```
PRINT/ZERO/SUM C21 ...   (no effect; null values will be
                          ignored)

PRINT/ZERO/SUM (C21+0)...(null treated as zero)
```

The EACH and ALL options of the TALLY command, described in Section 3.3.2, are available within the TALLY command only.

Restrictions

(1) Once called, a format option remains in effect throughout a given job unless the inverse option is requested.

(2) Options (1) through (8) apply to the PRINT command.

(3) Options (1), (7) and (8) apply to the LIST command.

(4) Option (1) affects output of the DESCRIBE and TALLY command.

(5) REPEAT SUPPRESS has no effect on a PRINT or LIST command without a WHERE clause; in this case the output is always in tree order.

3.3.5 System Functions

The purpose of the system functions is to permit the user to obtain arithmetic statistics about the data values contained in the data base.

Format

... <function name><function object>

where: <function name> = any of the six functions MIN, MAX, AVG, SUM, COUNT, SIGMA

<function object> = any element, repeating group, or user-defined function

The six system functions--MIN, MAX, AVG, SUM, COUNT and SIGMA--are provided for the purpose of operating on the contents of the data base. Except as noted in the Restrictions section, the system functions may be used to operate on any element or repeating group in the data base.

The command word for each system function is given below along with an explanation of the function:

MAX	The maximum value of any data item*
MIN	The minimum value of any data item*
COUNT	COUNT is the function which counts the number of times something occurs. Therefore, any data type may be used, including RG's
SUM	SUM is the function used to add the numeric value of requested elements. Only data types INTEGER and DECIMAL may be used with the function SUM
AVG	AVG is the standard average calculation: $\frac{\Sigma X}{n}$ which may be applied to data types INTEGER and DECIMAL

*Note: Alphabetic items in NAME and TEXT fields are ordered low to high from A to Z.

SIGMA SIGMA computes the standard deviation of data types INTEGER and DECIMAL using the following formula:

$$\mathrm{SIGMA} = \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1}$$

The output format associated with the six system functions includes the name of the system function in the stub. In all cases, a three letter abbreviation is used, as illustrated in the hypothetical example:

Given: (1) C1 is a type INTEGER element
(2) C1 exists in 5 data sets
(3) The five values for C1 are 5,5,3,3, and 1

```
PRINT MAX C1,MIN C1,COUNT C1,SUM C1,SIGMA C1,AVG C1:

MAX 1*  5
MIN 1*  1
CNT 1*  5
SUM 1*  17
SIG 1*  1.673
AVG 1*  3.400
```

Note that AVG and SIGMA output show results rounded to three decimal places. This is also the case for SUM output if DECIMAL values are included in the SUM. Because COUNT produces a count of existing elements or RG's, a command such as PRINT COUNT C1 WHERE C1 FAILS: will always produce the value zero. To count the number of times an element fails, an appropriate command would be

```
PRINT COUNT <repeating group> WHERE <element> FAILS:
```

i.e., print the count of occurring data sets for which the element is nonvalued.

Restrictions

(1) The system function COUNT may be used to count the occurrences of repeating groups; none of the remaining functions may reference repeating groups.

(2) SUM, SIGMA, and AVG may be used only with numeric type elements (INTEGER and DECIMAL).

(3) The six system functions cannot be used in a WHERE clause.

(4) No system function can reference more than one item. If multiple items are to be processed, the function name must be repeated with each item (for example, SUM C21,SUM C23... etc.).

Note that an item may be an in-line function such as (C21+C22) so that SUM(C21+C22) is legal.

(5) If enclosed in an in-line function the system function must be enclosed by itself within parentheses.

(6) The ZERO, ZERO SUPPRESS format option has no effect on system functions unless the object of the system function is presented as an in-line function, enclosed in parentheses.

3.3.6 In-Line Function

The purpose of an in-line function is to allow the user to express a mathematical function within a command.

Format

```
(1)  PRINT ... (<in-line function>) ...:

(2)  PRINT ... (<in-line function>)  ... WHERE ...:

(3)  LIST/.../... (<in-line function>) ... WHERE ...:

              {HIGH}
(4)  ... ORDERED BY {LOW } (<in-line function>) ...
```

An in-line function is an arithmetic expression which may contain element names or numbers, operand symbols, and constants. It can only contain numeric type elements (INTEGER, DECIMAL) and the entire function definition must be bracketed by left and right parentheses. The operational symbols that can be used are:

+	Addition
-	Subtraction
*	Multiplication
/	Division

The user may not specify the output format for the in-line function. Since mixed mode mathematics are allowed, the system will assign the output mode of the highest data type used, with DECIMAL fields taking priority over INTEGER fields. Also, since the user cannot assign a component number to the in-line function, the system assigns component numbers to the in-line functions starting with the number 5001.

Any of the six system functions may be used with an in-line function.

The following examples illustrate some valid PRINT statements utilizing in-line functions:

```
PRINT (C21/100) WHERE COMPANY NAME EQ DETROIT EDISON:

PRINT C5,C7,C8,(C115*12) WHERE C115 EXISTS:

PRINT (C1128-C1134) WHERE C803 EQ LIME:
```

Restrictions

(1) Only numeric INTEGER and DECIMAL type elements may appear within a function.

(2) If used within an in-line function, a system function must be enclosed by itself in parenthesis.

3.3.7 Ordering Statement

The purpose of the ordering statement is to control and thus alter the standard output order for those items in the <object list> of any PRINT or LIST operation.

Format

(1) PRINT <object list>, $\begin{bmatrix}\text{ORDERED BY}\\ \text{OB}\end{bmatrix}$ <ordering clause>
WHERE ...:

(2) LIST/ ... /<object list>, $\begin{bmatrix}\text{ORDERED BY}\\ \text{OB}\end{bmatrix}$ <ordering
clause> WHERE ...:

where: <object list> = element or repeating group names and numbers, in-line function references, and system functions

<ordering clause> = $\begin{Bmatrix}\text{HIGH}\\ \text{LOW}\end{Bmatrix}$ <item$_1$>, $\begin{Bmatrix}\text{HIGH}\\ \text{LOW}\end{Bmatrix}$ <item$_2$> ...

<item$_n$> = an element or RG identifier, in-line or system function

The ordering clause is introduced by the words ORDERED BY or their abbreviation, OB. The output that results from the PRINT or LIST command will be ordered by the first element in the ordering clause, then by the second, and so on. Each element in the ordering clause may be introduced by the optional directives, HIGH or LOW, with LOW being the default. These two sort words and their meanings are as follows:

LOW (default) = low-to-high (ascending) order, that is, 1,2,3,4..., or A,B,C,D....

HIGH = high-to-low (descending) order, that is, 12,11,10,9..., or V,U,T,S....

The items which may be specified within the ordering clause are: element name or "C" number, repeating group name or "C" number, and in-line function specifications, or system functions. To be meaningful in an ordering clause, a system function must have a BY clause (see Section 3.3.9), e.g. ... OB SUM C21 BY ENTRY WHERE... If an RG is used in an ordering clause, all its descendant data sets will be output together.

Examples

```
PRINT/NULL/C5,C7,C8,C14,C100, ORDERED BY PLANT EPA REGION
WHERE C1 EXISTS:
```

```
PRINT C5,C7,C8,OB C5,C7,C8 WHERE C803 EQ LIME:
```

Restrictions

(1) A command containing an ordering statement must include a WHERE clause.

(2) All items in the ordering clause must be in the same data base family.

3.3.8 LIST Command

The LIST command can be used to display output data in a columnar format with optional page headings and footings. The standard output from PRINT operations is a single vertical column of data. LIST command output is displayed in multiple columns, one column for each data item referenced in the command.

Sample Formats

```
(1) LIST/<option list>,TITLE <title specifications>/:
```

```
(2) LIST/TITLE <title specifications>/<list clause>:
```

(3) LIST/<option list>,TITLE <title specifications>/ <list clause>, <ordering clause> WHERE <conditions exist>:

(4) LIST <list clause>,<ordering clause> WHERE <conditions exist>:

where: <title specifications> = <page heading><page footing><column specifications>

<option list> = one or more format option statements separated by commas (see Secton 3.3.4)

<list clause> = <by clauses> and <object lists> or just <object lists>

<ordering clause> = ordering option (see Section 3.3.7)

<conditions exist> = series of legal WHERE clause conditions

<by clauses> = one or more BY clauses separated by commas, each having its own object list (see Section 3.3.9)

<object list> = element references (name or number), in-line function references, and system functions. Repeating groups may not be used

The third format illustrates the positioning of all the available specifications that can be used with the LIST command. It should be noted that the <option list> and the <ordering clause> are optional items and need not be included. These are discussed in Sections 3.3.4 and 3.3.7, respectively, of this manual. The <title specifications>, which is used only in the LIST command, consists of the following:

```
     /TITLE <page heading>, <page footing>, <column specifications>/
```

Of these three, only the <column specifications> are mandatory if a TITLE specification is to be used. The <page heading> and <page footing> options are specified according to the following format:

```
          page heading = D(<nn>)<text>,
          page footing = F(<mm>)<text>,
```

If either or both of these are to be used, they must follow the word TITLE and precede all the <column specifications>, e.g.,

```
     LIST/TITLE <column specifications>/...:
     LIST/TITLE D(<nn>)<text>,<column specifications>/...:
     LIST/TITLE F(<mm>)<text>,<column specifications>/...:
     LIST/TITLE D(<nn>)<text>,F(<mm>)<text>,<column specifi-
          cations>/...:
```

The "D(<nn>)<text>" allows the user to specify a report heading with the current date centered under the heading. The <nn> is the starting column of the heading "text." The heading will appear at the beginning of the report above the columnar headings.

The "F(<mm>)<text>" allows the user to specify a report footing and a page size. The <mm> is the number of lines which should appear on each page of "LIST" output. If both the "D" and "F" specifications are used, there will be <mm> minus 5 lines of

"LIST" output per page, including column headings. If only the "F" specification is used, there will be <mm> minus 2 lines of "LIST" output per page, including column headings. The minimum number of lines per page is ten and the maximum sixty. If the "D" specification is used, the page number will be printed on the heading line; if only the "F" specification is used, the page number will be printed on the footing line. If neither "D" nor "F" is used, there will be no page numbers. Page numbers are right justified (in the rightmost column indicated by the other LIST parameters) on the line and are a maximum of four digits. It is up to the user to specify some meaningful label for the page number (such as "PAGE") and to locate the label next to the page number. The heading or footing <text> may be blank or null.

The column specifications may be made up of a single specification or several specifications separated by commas. Each specification may include two fields of format identification, <type> and <title>, but need not include both.

The <type> field is identified as:

```
               L
<type>   =     R   (<integer>)
               B
```

```
where:  L  =  left-justified column <title>
        R  =  right-justified <title>
        B  =  column to be blank and its <title>, if any,
              left-justified
```

<integer> = number of character positions in this column

Examples of specified <type> fields would be R(12), L(5), B(30), etc. If <type> is not specified, the <title> (which is simply the heading that will precede each column) will be left-justified and the column width will be specified implicitly by the size of the <title> specification.

The field width for a column is the maximum of (1) the <integer> value given in the <type> specification or, (2) the number of characters and blanks used in the <title> specification. Since the <title> specification is treated as text material; leading, trailing and embedded blanks may be used to control the exact placement of each of the three available lines of the <title> specification, if centering of the <title> words is important.

The <title> field may have any of the following forms:

<title> = (a) <string of characters>
(b) <string of characters>+<string of characters>
(c) <string of char.>+<string of char.>+<string of char.>
(d) +<string of characters>
(e) +<string of characters>+
(f) ++<string of characters>
(g) +<string of characters>+<string of characters>
(h) <string of characters>+<string of characters>+
(i) <string of characters>++<string of characters>

where: <string of char.> = the characters which will become the column heading, limited in number only by the output device in use

+ (plus sign) = indicates a new line, three lines allowable per column heading; also controls which lines will be blank

Using the title specifications just given, the following represents the resultant column header formats:

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
Line 1	↔	↔	↔					↔	↔
Line 2		↔	↔	↔	↔		↔	↔	
Line 3			↔			↔	↔		↔

Columns which contain data are known as "material fields." There may be up to 40 material fields. Within material fields, data of type NAME and TEXT will be left-justified with a wrap-around capability up to five lines. All DECIMAL and INTEGER values will be right-justified with no wrap-around capability. If the field width of the <specification list> is too narrow to contain the data, only the most significant digits will be displayed and an asterisk will indicate overflow. For data types NAME and TEXT, the overflow asterisk will occur only on the fifth line.

The order in which items appear in the <object list> corresponds to the sequence of material fields included in the <column specification>. If there are fewer material fields in the <column specification> than in the <object lists>, the explicit assignments will apply to the leftmost items of the <object list> and default column headings and field widths will be used for the remaining items.

In LIST output there is a line between the column headings and the first line of data consisting of three asterisks starting from the left margin. The first character of the first field specification starts in the fourth column. With every line of non-wrapped-around data, an asterisk is printed in column one.

The NULL format option does not affect LIST output. If an entire line would be NULL, it is omitted.

Two examples of the LIST command using the FGDIS data base are given below. The first represents the LIST command in situations where the data will require less than one page and where no page headings or footings are desired. The second illustrates the use of both headings and footings; it is intended to portray a situation where more than one page of data would be output. Both commands contain a simple where clause which should be self explanatory.

```
>LIST/TITLE L(27)COMPANY+NAME,L(15)UNIT+NAME,UNIT+
>NUMBER,L(6)FUEL+TYPE/C5,C7,C8,C201,OB C5,C7,C8
>WHERE C213 GT 4.5:
```

```
*  COMPANY                     UNIT            UNIT   FUEL
   NAME                        NAME            NUMBER TYPE
***
*  ASSOCIATED ELECTRIC COOP    THOMAS HILL     3      COAL
*  COLUMBUS & SOUTHERN OHIO EL CONESVILLE      5      COAL
   EC
*  COLUMBUS & SOUTHERN OHIO EL CONESVILLE      6      COAL
   EC
*  DELMARVA POWER & LIGHT      DELAWARE CITY   1      COKE
*  DELMARVA POWER & LIGHT      DELAWARE CITY   2      COKE
*  DELMARVA POWER & LIGHT      DELAWARE CITY   3      COKE
*  GULF POWER                  SCHOLZ          1A     COAL
*  GULF POWER                  SCHOLZ          1B,2B  COAL
*  KANSAS CITY POWER & LIGHT   LA CYGNE        1      COAL
*  LOUISVILLE GAS & ELECTRIC   CANE RUN        6      COAL
---
>
```

```
>LIST/TITLE D(25)SULFUR CONTENTS,F(20)FLUE GAS
>DESULFURIZATION INFORMATION SYSTEM,
>L(27)COMPANY+NAME,L(15)UNIT+NAME,UNIT+NUMBER,
>FUEL+SULFUR+CONTENT/C5,C7,C8,C213,
>OB C5,C7,C8 WHERE C213 GT 3.5:

                      SULFUR CONTENTS                        1
                        04/13/1981

*  COMPANY                      UNIT            UNIT     FUEL
   NAME                         NAME            NUMBER   SULFUR
                                                         CONTENT
***
*  ASSOCIATED ELECTRIC COOP     THOMAS HILL     3           4.80
*  BIG RIVERS ELECTRIC          GREEN           1           3.75
*  BIG RIVERS ELECTRIC          GREEN           2           3.75
*  CENTRAL ILLINOIS LIGHT       DUCK CREEK      1           3.66
*  CENTRAL ILLINOIS PUBLIC SER  NEWTON          2           4.00
   V
*  CINCINNATI GAS & ELECTRIC    EAST BEND       1           4.00
*  CINCINNATI GAS & ELECTRIC    EAST BEND       2           4.00
*  COLUMBUS & SOUTHERN OHIO EL  CONESVILLE      5           4.67
   EC

FLUE GAS DESULFURIZATION INFORMATION        SYSTEM



                      SULFUR CONTENTS                        2
                        04/13/1981

*  COMPANY                      UNIT            UNIT     FUEL
   NAME                         NAME            NUMBER   SULFUR
                                                         CONTENT
***
*  COLUMBUS & SOUTHERN OHIO EL  CONESVILLE      6           4.67
   EC
*  COMMONWEALTH EDISON          POWERTON        51          3.53
*  DELMARVA POWER & LIGHT       DELAWARE CITY   1           7.00
*  DELMARVA POWER & LIGHT       DELAWARE CITY   2           7.00
*  DELMARVA POWER & LIGHT       DELAWARE CITY   3           7.00
*  GULF POWER                   SCHOLZ          1A          5.00
*  GULF POWER                   SCHOLZ          1B,2B       5.00
*  KANSAS CITY POWER & LIGHT    LA CYGNE        1           5.39
*  KENTUCKY UTILITIES           GREEN RIVER     1-3         4.00
*  LOUISVILLE GAS & ELECTRIC    CANE RUN        4           3.75

FLUE GAS DESULFURIZATION INFORMATION        SYSTEM
```

3.3.9 BY Clause

The purpose of the BY clause is to permit retrieval of data from disjoint data sets. It can also be used to control the particular subsets of data on which system functions will operate. Whenever appropriate, it may be issued in conjunction with the PRINT and LIST commands.

Format

(1) PRINT <object list>:

(2) PRINT <object list>, <by clause>, <by clause>:

(3) PRINT <by clause> WHERE <conditions exist>:

(4) PRINT <system function> <function object> <by phrase>:

(5) PRINT <object list>, <by clause>, <system function> <function object> <by phrase> WHERE <conditions exist>:

where: <object list> = any item legally referenced in a <print clause>, including items from disjoint data sets

<by clause> = <by phrase>, <object list>

<by phrase> = BY followed by an RG name or number including "DATA BASE"

<conditions exist> = any of the legal WHERE clause conditions

<system function> = any of the six built-in system functions -- SUM, COUNT, etc.

<function object> = any component that may be legally operated upon by the associated function

The five formats shown have been selected to facilitate discussion of the BY clause concept; they do not represent all possible command structures incorporating BY clauses.

In general, a command may contain any combination of items, including BY clauses, in a complex PRINT clause as covered in the PRINT command discussion in Section 3.3.3. Format (5) is intended to represent the most general case.

A fundamental dichotomy relating to the BY clause concept is that if a command does not contain a WHERE clause, it always contains a BY clause, whether specified by the user or not. Conversely, if a command does contain a WHERE clause, it never has a BY clause unless specified by the user. In all cases, the presence of a BY clause controls the manner in which the data base is scanned and, as a consequence, the ordering of the output.

With the exceptions to be explained, BY clause processing is identical in concept to the processing used with a PRINT <RG> command. The PRINT ENTRY command, for example, causes the entire data base, including disjoint data values, to be printed in tree order -- that is, in accord with the logical rather than the physical order of data set placement. The only difference between BY clause processing and a PRINT <RG> command is that with a PRINT <RG> command, all element values qualifying will be printed in tree order, grouped on an RG-by-RG basis. BY clause processing also scans the data base and will therefore print disjoint data values in tree order, but the output will only contain the items specified in the <object list>; grouping will still be by the RG referenced in the <by phrase>.

By definition, the highest level RG that may be specified in a BY clause is DATA BASE, and when there is no WHERE clause, SYSTEM 2000 always assumes that the PRINT clause is enclosed in a BY DATA BASE phrase. The BY DATA BASE phrase may also be specified by the user. In either case, BY DATA BASE is assumed to reside at level -1, and qualifies the entire data base for processing by the command. The following two commands are identical in result, for instance:

```
(1)  PRINT C5,C102:  (BY DATA BASE assumed)
(2)  PRINT BY DATA BASE,C5,C102:
```

The result of both commands would be the same. The same output would also be the result if the <object list> were reordered, or with BY DATA BASE replaced with BY ENTRY, as in the following:

```
(1)  PRINT C102,C5:  (BY DATA BASE assumed)
(2)  PRINT BY ENTRY,C102,C5:
```

The output ordering would not, however, be the same with the following command:

```
PRINT C5,BY DATA BASE,C102:
```

This command is actually of the form:

```
PRINT BY DATA BASE, (C5,BY DATA BASE,C102):
```

The first, or implied, BY DATA BASE phrase has as its object list everything within the brackets. That is, the entire data base is considered as qualifying for tree order processing of the <object list>. Within the <object list>, SYSTEM 2000 processes beginning with the highest level reference in the list. Items at the same level are processed in the order listed. In this case, because BY DATA BASE is the highest level item (BY DATA BASE is at the -1 level, while C5 resides at level 0), it is processed first followed by a listing of the C5 values.

Of the commands discussed so far, the two prefixed by (1) are of format (1) in the format example, and the remainder are of the general form of format (2). In the commands having format (2), only one BY clause has been given.

In practice, the command may contain several separate BY clauses. Multiple BY clauses are separated, or terminated, by a WHERE clause, an ordering clause, another BY clause or the colon.

All rules given thus far also apply when the command contains a WHERE clause (formats (3) and (5)). The tree order processing of BY clauses again permits retrievals from disjoint data sets, and all rules covering the ordering of output pertain. As stated at the outset, however, in commands having a WHERE clause, a BY clause must be explicitly included if disjoint data sets are to be accessed. SYSTEM 2000 in this case does not assume a default of BY DATA BASE, as this would essentially contradict the purpose of the WHERE clause -- viz., to restrict the qualifying portions of the data base to just those parts of the data base of interest.

This latter observation, in fact, must be considered when a BY clause is included in a command containing a WHERE clause. The BY clause process, by definition, qualifies one or more trees of data sets depending on the RG level specified. If BY DATA BASE is specified, the entire data base qualifies, and it is considered as a single tree having its top node at level -1. If BY ENTRY is specified, the top node is level 0, and every logical entry in the data base potentially qualifies for output.

The number of trees that potentially qualify is equal to the number scanned for output when there is no WHERE clause. With a WHERE clause, however, only those trees will be scanned that also satisfy the WHERE conditions. For instance, the command PRINT BY ENTRY, C5 WHERE C5 EQ DETROIT EDISON would produce the following output:

```
5* DETROIT EDISON
```

All entries were potentially qualified by the BY ENTRY phrase, however only the entry DETROIT EDISON qualifies as a result of the WHERE clause.

The user may find it helpful to look at commands containing both BY and WHERE clauses from the point of view suggested by the last sentence. Specifically, the presence of a BY clause potentially qualifies every tree in the data base which has as its top node the RG specified in the BY clause. But only those qualify for final processing which "HAVE" the conditions specified in the WHERE clause. The previous command could be thought of, in other words, as having the following form:

```
PRINT BY ENTRY, C5 WHERE ENTRY HAS C5 EQ DETROIT EDISON:
```

An important application of the BY clause lies in its use to enclose one or more of the six system functions. This permits the user to restrict the calculation of the function to particular parts of the data base. When a BY clause is used for this purpose, it may be specified in either of two ways; complex commands may contain mixtures of the two. The first way of structuring the command is to include the system function and its object both in the <object list> shown in the first two formats. That is, a command might be structured as follows:

```
PRINT BY ENTRY, C5, COUNT C201, C803, COUNT C1105:
```

If issued for the FGDIS, the result would look like the following:

```
   5* ALABAMA ELECTRIC COOP
 CNT  201* 1
 CNT  1105* 1
    803* LIMESTONE
   5* ALABAMA ELECTRIC COOP
 CNT  201* 1
 CNT  1105* 1
    803* LIMESTONE
   5* MONONGAHELA POWER
 CNT  201* 1
 CNT  1105* 1
    803* LIME
   5* ARIZONA ELECTRIC POWER COOP
 CNT  201* 1
 CNT  1105* 1
    803* LIMESTONE
   5* BASIN ELECTRIC POWER COOP
 CNT  201* 1
 CNT  1105* 1
    803* LIMESTONE
```

Other acceptable commands of this type are as follows:

```
PRINT BY C100, COUNT C102, SUM C108:

PRINT COUNT C102, BY ENTRY, SUM C108:

PRINT AVG C108, SUM C108, BY C100, C102:
```

The second format is represented by the following examples:

```
PRINT SUM C108 BY ENTRY:

PRINT C5, C100, SUM C213 BY C200:

PRINT SUM C108 BY C100, AVG C21 BY ENTRY:
```

Regardless of the format, the effect of enclosing a system function in a BY clause is to cause the calculation of that function over just that subset of the data base defined by the RG in the BY clause.

Restrictions

(1) The RG specified in the BY clause must be at or above the highest hierarchical level referenced in the <object list>.

(2) Without a BY clause, disjoint data sets may not be specified in the object list.

3.3.10 WHERE Clause

The purpose of the WHERE Clause is to specify the conditions required to qualify data sets from which retrievals or updates are to be made.

Format

```
... WHERE <conditions exist>:

where:  <conditions exists>  = any number of legal WHERE
                               clause conditons as defined
                               in the following statements:
```

(1) Unary Operator Condition

```
<element>  [EXISTS]
           [FAILS ]
```

(2) Binary Operator Condition

```
<element>  [EQ] <value>
           [NE]
           [LT]
           [LE]
           [GT]
           [GE]
```

(3) Ternary Operator Condition

```
<element>   SPANS    <value><system separator>
                     <value>
           [NE]
           [EQ]
```

(4) Normalized Condition

```
<repeating group> HAS <condition>
```

A fundamentally significant syntactic unit is the WHERE clause. The conditions modifying WHERE can be simple or complex combinations of restrictions on the qualifying data sets. All WHERE clauses employ system operators of one type or another -- e.g., EQUALS, GREATER THAN, and so forth. Although these are not discussed until a later section, an understanding of their meaning will be assumed in the present discussion. Most are self-explanatory and no more than brief reference to later material should be necessary in following this discussion.

The effect of a WHERE clause is to focus data retrievals on just those segments of the data base of specific interest. Without a WHERE clause, the entire data base qualifies and every valued retrieval component specified will be output. There would be considerable difference in the output produced from the FGDIS data base, for example, by issuing these two commands:

```
PRINT COMPANY NAME:
PRINT COMPANY NAME WHERE PLANT STATE/COUNTRY EQ OHIO:
```

In a command containing a WHERE clause, the WHERE clause is processed first to determine which portion of the data base should be considered for those actions specified to the left of the WHERE clause.

Three new terms are required at this point to assist in the understanding of the WHERE Clause processing.

(1) Specified Data Sets - the data sets implicitly identified by the components listed to the left of the WHERE clause statement in a retrieval request. The component may be identified by name or by number. The data sets are implicitly identified by requesting elements within the data sets or naming the repeating group which

generates the Specified Data Sets. The level within the data base structure where these Specified Data Sets occur is of great importance. If elements are used to identify the Specified Data Sets, then the elements and the data sets will be at the same level, since the elements come from within the data set. If a repeating group is used to identify the data sets, then the Selected Data Sets will occur at one level below the listed repeating group.

(2) Qualified Data Sets - data sets that satisfy the entire WHERE clause condition(s). When the system starts processing a command it processes the WHERE clause first. Those data sets which satisfy all the conditions in the WHERE clause are temporarily "collected" and tested to see if any of the Qualified Data Sets are named or implied by the Specified Data Sets. If they are, they become:

(3) Selected Data Sets - data sets produced from the Qualified Data Sets. That is, those data sets named by the Specified Data Sets and selected by qualification for retrieval.

As explained previously, some retrieval requests do not use the WHERE clause. If the request contains no WHERE clause, then the entire data base qualifies for output. If a WHERE clause is used, but no data sets satisfy the conditions imposed by the WHERE clause, no action is taken for the request. If a list of Qualified Data Sets is produced, then each Qualified Data Set is examined to see if it is also a Specified Data Set. If it is, then it becomes a Selected Data Set. If all components in the WHERE clause reference only the Specified Data Sets, then all Qualified Data Sets are also the Selected Data Sets. The following examples which utilize the FGDIS definition should help to illustrate use of the WHERE clause.

```
PRINT STACK SHELL, STACK FLUE LINER WHERE STACK SHELL
     EXISTS:
```

In this case, the Qualified Data Sets are the Selected Data Sets. The WHERE clause may frequently contain components which produce Qualified Data Sets which are not the same as, or do not occur at the same level as, Specified Data Sets. If this happens, a level adjustment up or down must be made for each Qualified Data Set that does not belong to the Specified Data Set. Level adjustment in these instances will be either upward or downward depending upon the Specified Data Sets and the relationship of the particular Qualified Data Set being adjusted, but the normalization will always be to the lowest-level element referenced in the Specified Data Sets. These lowest-level elements will never be output redundantly due to duplicate data set qualification.

Upward level adjustment takes place when the Qualified Data Set is a descendant (at whatever level) lying below the Specified Data Set according to the hierarchy of the data base definition. The adjustment follows an upward path from the Qualified Data Set to its ancestral data set, the Specified Data Set. If ENTRY or C0 is the Specified Data Set and the Qualified Data Sets lie below level 0, then the upward level adjustment selects entire logical entries and the Selected Dat Sets are all level 0 data sets.

PRINT UNIT DATA BOILER - STACK WHERE FUEL TYPE EQ COAL:

In this case, the Qualified Data Sets are one level lower than the Specified Data Sets. The Qualified Data Sets are adjusted upward one level to the Specified Data Set level for retrieval of the Selected Data Sets. This command will cause not only the qualifying UNIT DATA - BOILER & STACK to print, but also the descendant ACTUAL FUEL DATA associated with each UNIT DATA - BOILER & STACK group since the repeating group name was used as the Specified Data Set (unless the GROUP format option is in effect).

If the Specified Data Sets are named by an element from within a repeating group, then the Selected Data Sets will contain the elements specified and descendants are not displayed.

Downward level adjustment takes place when the Qualified Data Sets occur at a higher level than the Specified Data Sets. Another way of stating the same situation is to say that the Qualified Data Set is an ancestor of the Specified Data Set. All paths are followed downward from each Qualified Data Set to all descendant Specified Data Sets and these become the Selected Data Sets. Downward level adjustment may produce none, one, or many Selected Data Sets from one Qualified Data Set depending upon how many descendants exist. Again, unless otherwise qualified, all descendants from the Selected Data Sets are output if the Specified Data Sets are named by use of a repeating group.

PRINT ACTUAL FUEL DATA WHERE STACK SHELL EQ CONCRETE:

When the Qualified Data Set does not belong to the same family repeating group represented by the Specified Data Set, the HAS operator must be used to raise all Qualified Data Sets in the WHERE clause up to the common intersection between the Qualified Data Sets and the disjoint components of the PRINT clause. (See Section 3.3.15 for use of the HAS operator.)

If the user desires to control the level at which qaulification takes place, he may further constrain the WHERE clause statements by use of the HAS operator. The use of HAS actually allows the user to specify the level at which qualification takes place.

The examples given in the above paragraphs have all been relatively simple. Much more complex commands can be structured; when they are, all of the various rules given herein must be observed if the correct result is to be obtained.

Within the restrictions given above, it is possible to structure complex commands containing multiple component names to the left of the WHERE clause which may or may not reside at the same level in the data base, <u>and</u> the WHERE clause may impose multiple conditions on one or more elements also residing at one or more levels within the data base.

A hypothetical example of an acceptable complex command which refers to the FGDIS definition is as follows:

```
PRINT C5,C7,C8,C10,C12 WHERE C15 EXISTS AND C21 GT 100 AND
      (C207 GT 10000 OR C213 GT 2.0) AND C215 EXISTS:
```

<u>Restrictions</u>

(1) The use of a WHERE clause is illegal when unrelated,* disjoint elements or repeating groups appear in the object list of the PRINT clause unless a BY clause is used. (Section 3.3.9)

---

* Unrelated or disjoint components are defined as those not a part of the same repeating group family, e.g., element 1907, PUMP MANUFACTURER, is a member of the PUMPS repeating group and would be disjoint with element 1806 TANK TYPE, which is a member of the TANKS repeating group.

(2) The WHERE clause may contain up to and including 80 operands, where an operand is an element, repeating group or a value.

(3) The WHERE clause may contain up to and including 58 operators where an operator includes: AND, OR, NOT, left and right parentheses, HAS, AT, EQ, NE, LT, LE, GT, GE, EXISTS, FAILS, SPANS, SAME.

3.3.11 Unary Operators: EXISTS, FAILS

The purpose of the unary operators is to test for the existence or the nonexistence of data values.

Format

```
...WHERE <element> EXIST, EXISTS, or EXISTING
                   FAIL, FAILS, or FAILING
```

where: <element> = element name or "C" number

The use of the three forms of EXIST will limit qualification to data sets whose specified element is valued. The use of FAILS limits qualification to the data sets whose specified element has no data value. The use of unary operators within typical commands is quite varied. An example of using EXISTS to verify the use of a specific piece of equipment would be:

```
PRINT COMPANY NAME WHERE TANK TYPE EXISTS:
```

The FAILS operator is used basically to qualify a data set which has a non-valued element but it is also used to qualify a parent data set which has no descendant data sets of the type being tested. An example of this using the FGDIS data base would be:

```
PRINT COMPANY NAME, PLANT NAME WHERE PLANT CITY FAILS:
```

Restriction

(1) A repeating group may not be used as the element to test the existence or nonexistence of data values.

3.3.12 Binary Operators: EQ, NE, LT, LE, GT, GE

The purpose of the binary operators is to define, limit or bound the range of qualifying data sets.

Format

...WHERE <element> <binary operator> <specific value>:

where: <element> = element name or "C" number

<binary operator> =

EQ	equal
NE	not equal
LT	less than
LE	less than or equal to
GT	greater than
GE	greater than or equal to

<specific value> = a value

Binary or relational operators are used within the condition statement of the WHERE clause. The following examples illustrate their use:

```
...WHERE C213 GE 2.0:

...WHERE C21 GT 100 AND C213 GE 2.0:

...WHERE C22 LT 100 OR C22 GT 200:
```

3.3.13 Ternary Operators: EQ, NE, SPANS

The purpose of the ternary operators is to qualify data sets on the basis of a range of values.

Format

...WHERE <element> <ternary operator> <value$_1$>*<value$_2$>:

where: <element> = element name or "C" number of any data

<ternary operator> = $\begin{bmatrix}\text{EQ}\\ \text{SPAN}\\ \text{SPANS}\\ \text{SPANNING}\end{bmatrix}$ (Equivalent inclusive range discriminators)

or

NE (Exclusive range discriminator)

<value$_1$>*<value$_2$> = literal values where value$_1 \leq$ value$_2$, two values separated by the system separator

The ternary operators are quite useful when data sets need to be qualified on the basis of a range of values. EQ and NE have been used before as binary operators when they were comparing elements to a single value. Used as ternary operators they compare elements with either an inside or outside range of values. EQ and the three forms of SPANS are equivalents and are used as the inclusive range discriminator, e.g.,

...WHERE C21 SPANS 150 * 200:

or

...WHERE C21 EQ 150 * 200:

Both of these hypothetical examples would produce identical results which would test the value range of C21 from 150 to 200, inclusively.

NE, on the other hand, is used when an exclusive range discriminator is required, e.g., ...WHERE C21 NE 150*200 would be interpreted as C21 LT 150 or C21 GT 200.

3.3.14 Boolean Operators: AND, OR, NOT

The purpose of the Boolean operators is to indicate the logical relationship between the conditions found in the WHERE clause.

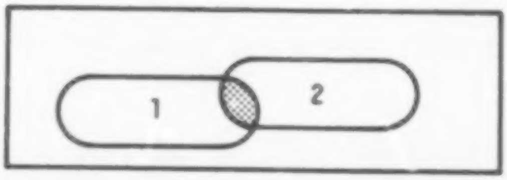
Format

(1) ...WHERE <condition> $\begin{bmatrix}\text{AND}\\\text{OR}\end{bmatrix}$ <condition>...:

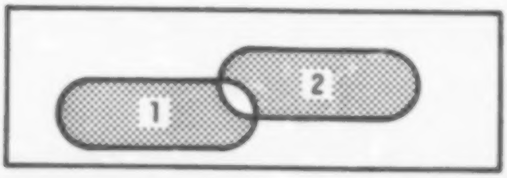
(2) ...WHERE NOT <condition>...:

where: <condition> = any one of the many WHERE clause conditional statements

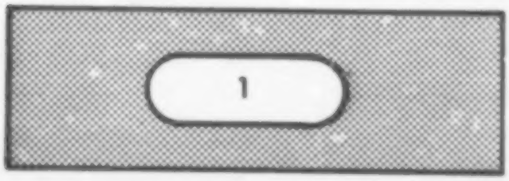
The Boolean operators AND, OR, and NOT are used to indicate the relationship between the conditions found in the WHERE clause. When AND is used, the data set values eligible for output must satisfy both conditions. When OR is used, the WHERE clause is satisfied by those data sets for which either condition is satisfied. Where NOT is used, the WHERE clause is satisfied by all data sets which do not satisfy a condition. The shaded areas (the area qualifying in each of the diagrams below) illustrate the logic of the three operators:



AND



OR:



NOT:

If the conditions in the WHERE clause related by AND or OR contain components that are not defined to be in the same repeating group family (disjoint data sets) the conditions must include the use of the HAS operator to raise all data sets that satisfy the conditions to at least the level of the first common intersection of the disjoint repeating groups. If the HAS operator is not used with the disjoint data sets, the request will not be processed. (See Section 3.3.15 for use of the HAS operator).

When the WHERE clause contains only a single Boolean operator, the natural order of Boolean operator processing is not involved. But when Boolean operators are linked together into Boolean combinations, the implicit processing order, without nesting, is first NOT, then AND, and finally OR. The user can further control the WHERE clause qualifications by nesting the operators as in one of the following formats, keeping in mind that statements enclosed by paired parentheses are processed before unnested conditions.

PRINT...WHERE (<condition$_1$> AND <condition$_2$>):
Since no conditions lie outside of the parentheses, they are ignored and the WHERE clause is processed as though the parentheses had been omitted.

PRINT...WHERE NOT (<condition$_1$> AND <condition$_2$>):
Because of nesting, the statement within the parentheses is processed first; all data which meet both <condition$_1$> and <condition$_2$> are selected. The NOT connective causes this data then to be excluded.

PRINT...WHERE (<condition$_1$> OR <condition$_2$>) AND
(<condition$_3$> AND <condition$_4$>):

First, the OR of (<condition$_1$> OR <condition$_2$>) is found; next, the AND of (<condition$_3$> AND <condition$_4$>) is found, and finally, the AND of these two results is found.

PRINT...WHERE (<condition$_1$> OR <condition$_2$>) AND
(NOT (<condition$_3$> AND <condition$_4$>)):

(a) The AND of <condition$_3$> and <condition$_4$> is found; the NOT of that result is then found.

(b) The OR of <condition$_1$> and <condition$_2$> is then found.

(c) The AND of results (a) and (b) is then used for output.

Conditions 3 and 4 are nested two levels deep while conditions 1 and 2 are nested one level deep. The request contains two nestings of conditions.

Restrictions

(1) If either AND or OR are used as WHERE clause operators, and if WHERE clause components related by these operators are not in the same repeating group family (disjoint data sets), the HAS operator must be used to raise all data sets that satisfy the WHERE clause conditions to at least the level of the first common intersection of the disjoint data sets.

3.3.15 HAS Operator

The purpose of the HAS operator is to allow the user to specify the level of data set qualification above the data set level of conditional qualification.

Format

...WHERE <repeating group> $\begin{bmatrix}\text{HAS}\\ \text{HAVE}\\ \text{HAVING}\end{bmatrix}$ <condition>:

where: <repeating group> = repeating group name or "C" number

<condition> = any of the WHERE clause conditional statements, nested or unnested

The HAS operator allows qualification of data sets based on the contents of descendant data sets. It allows the user to raise the level of the qualified data sets up to the level of the repeating group specified for the HAS operator. Use of the HAS option increases the user's span of control in selecting data sets to be retrieved or modified. One of the basic structural rules of SYSTEM 2000 is that an element can only assume one value within a data set. If the user wishes to retrieve something on the basis that a single element contains "this" value and also "that" value, he must use the HAS clause. A WHERE clause such as ...WHERE C2501 EQ INTERIM AND C2501 EQ FINAL: would be illogical since the element C2501 can only take on one value in each data set and thus, the WHERE clause would be unsatisfied.

HAS, then, allows the user to qualify a higher level data set based on the fact that it has a value in a descendant data set and a different value for the same element in another descendant set. Therefore, a WHERE clause properly constructed to accomplish the desired results would be as follows:

...WHERE C0 HAS C2501 EQ INTERIM AND C0 HAS C2501 EQ FINAL:

The system logic associated with the use of the HAS command gives the user the ability to choose the level at which a data set will become a Qualified Data Set. The <repeating group> given to the left of the HAS in a WHERE clause statement actually specifies the data sets which can qualify and become Qualified

Data Sets. The order of processing, then, is as follows: When the condition in a WHERE clause is satisfied, SYSTEM 2000 checks to see if the condition has been modified by a HAS operator. If not, the data set which satisfied the condition becomes a Qualified Data Set. If a HAS operator is present, the data set mentioned on the left side of the HAS becomes the Qualified Data Set.

The use of the HAS operator is mandatory if the user has formed a retrieval request in which the components given in the PRINT clause are not in the same repeating group family as the components given in the WHERE clause conditions. In such a case, the WHERE clause must contain the use of HAS where the repeating group specified for the HAS is the common intersection (or higher intersection) of the components of the PRINT clause and the components of the WHERE clause. For example, since UNIT DATA - BOILER & STACK and FGD SYSTEM are two disassociated repeating groups, the command PRINT BOILER SUPPLIER WHERE NEW/RETROFIT EQ NEW: will produce no output.

The following command would produce the desired result:

```
PRINT BOILER SUPPLIER WHERE C0 HAS NEW/RETROFIT EQ NEW:
```

An alternative method involves a BY clause in the PRINT statement where the object repeating group of the BY clause represents a data set in the same family as those represented in the WHERE clause:

```
PRINT BY C0, BOILER SUPPLIER WHERE NEW/RETROFIT EQ NEW:
```

The use of HAS is mandatory also if the WHERE clause contains AND or OR operators that join conditions that do not belong to the same repeating group family. HAS must be used to specify the first common intersection (RG) of the disjoint conditions so that all conditions have a common intersection point. The common intersection may occur, by definition, at any level. The RG specified for the HAS operator may be the RG at the lowest level of intersection between the two disjoint conditions or it may be a higher level ancestor RG of the common intersection.

If the HAS operator is not used in the above mandatory cases, no output will result.

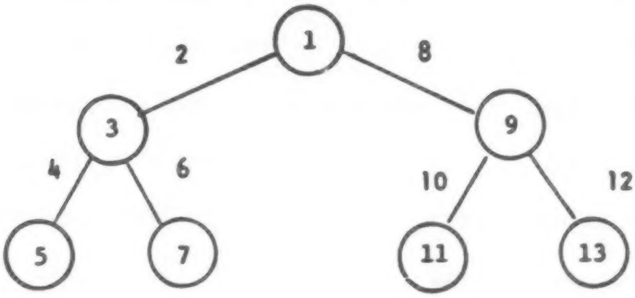
If the repeating group name happens to be plural in the definition, or if proper English would dictate, the user may use HAVE instead of HAS; HAVING is also acceptable.

The HAS operator may also be used to handle a multiple nesting problem should a complex application require such a solution. Utilizing a simulated data base structure, but not an unrealistic one, notice the use of HAS associated with the collection of disjoint data sets in the following example.

Hypothetical Data Base Definition

```
1* A (NAME);
2* B (RG):
  3* C (NAME IN 2):
  4* D (RG IN 2):
    5* E (NAME IN 4):
  6* F (RG IN 2):
    7* G (NAME IN 6):
8* H (RG):
  9* I (NAME IN 8):
 10* J (RG IN 8):
   11* K (NAME IN 10):
 12* L (RG IN 8):
   13* M (NAME IN 12):
```

If a single data set were constructed for each repeating group represented by the above hypothetical definition, seven (7) data sets would be produced, including the implied one at level zero, each one in a horizontal plane being disjoint one from the other, as in the following schematic:



It is quite obvious from the above that unless a BY clause is used, practically any retrieval or update would require the use of HAS in a qualifying WHERE clause. The following example of a complex WHERE clause is given to stimulate the user in developing his skill in utilizing this powerful tool represented by the command verb HAS.

```
PRINT <object list> WHERE ENTRY HAS ((C2 HAS C5 EXISTS AND
      C2 HAS C7 EXISTS) AND (C8 HAS C11 EXISTS AND C8 HAS
      C13 EXISTS)):
```

3.3.16 DITTO Operator

The purpose of the DITTO operator is to copy the action statement of the most recent command.

Format

(1) DITTO:

(2) DITTO WHERE <conditions exist>:

where: <conditions exist> = any of the legal WHERE clause qualification conditions

The DITTO command is a convenience, never a requirement, and can be used to refer to prior DESCRIBE, TALLY, PRINT or LIST commands. DITTO is to the <action clause> what SAME is to the <where clause>. If the previous command contained a WHERE clause, then the DITTO command must also contain a WHERE clause.

Example:

```
PRINT C5,C7,C8,C102,C213 WHERE C812 EQ 1:

DITTO WHERE C812 EQ 2:
```

The DITTO Operator may be issued with no conjunction following, as in format (1), and when so used, the previous command must not have had a conjunction.

Example:

```
PRINT C1207, C1306:

DITTO:
```

3.3.17 SAME Operator

The purpose of the SAME operator, used within a WHERE clause, is to call and use qualified data sets from a previously used WHERE clause.

Format

...WHERE SAME:

...WHERE SAME $\begin{bmatrix}\text{AND}\\ \text{OR}\end{bmatrix}$ <conditions exist>:

...WHERE <conditions exist> $\begin{bmatrix}\text{AND}\\ \text{OR}\end{bmatrix}$ SAME...:

...WHERE (<condition$_1$> $\begin{bmatrix}\text{AND}\\ \text{OR}\end{bmatrix}$ SAME)
$\begin{bmatrix}\text{AND}\\ \text{OR}\end{bmatrix}$ <condition$_2$> $\begin{bmatrix}\text{AND}\\ \text{OR}\end{bmatrix}$ SAME...:

Like the DITTO command, the SAME command is a convenience, not a requirement. It allows the user to refer to the conditions specified in the previous WHERE clause without having to re-enter the conditions. The two commands that follow would produce the same output, since the SAME refers to the conditions of the initial command.

```
PRINT C5,C7,C8 WHERE C201 EQ COAL AND C213 GT 2.0:
PRINT C5,C7,C8 WHERE SAME:
```

The SAME command is simply a direct reference to the last WHERE clause used.

3.4 REPORT WRITER FEATURE

The report writer feature of SYSTEM 2000 provides the user with the capability of creating formatted reports utilizing data contained within the data base in use. The commands used within the report writer mode are straight forward and are presented in the MRI SYSTEM 2000 manual. For the purposes of the FGDIS, various programs have been developed that are stored in a file external to the data base. These programs can be called at any time during use of the FGDIS for the purposes of generating a report in the format specified by the particular program. Appendix A provides documentation on all the programs available for use. Included in the documentation is a brief abstract as to the function of the program, a sample runstream providing instruction as to the use of the program, sample output created by the program using FGDIS data, and suggested uses and comments. New documentation sheets will be made available as new programs are developed. It should be noted that the report writer feature provides great flexibility and most desired formats can be accommodated with few exceptions. Should the need arise for a specific type of output, PEDCo personnel should be notified so that the proper program can be developed. This is especially important from the standpoint that a program developed to satisfy the needs of one user may in fact provide assistance for others interested in the same type of information.

The first step in using a report writer program is to issue the following command:

```
@ADD FGDIS.[program name]
```

This command should be issued while in the data base, and will be followed by two dashed lines and the computer prompter (>). At this point, a GENERATE statement should be entered in order to request report execution. The format of the GENERATE statement is as follows:

```
GENERATE <program name> {WHERE <where clause>}:

where:  <program name>      = the name of the program being
                              used (which must correspond to
                              the name used in the step
                              above)

        <where clause>      = any legal SYSTEM 2000  WHERE
                              clause (Section 3.3.10),
                              except SAME, to determine
                              which sections of the data
                              base are to be selected
```

Output of the requested report will be preceded by the message:

-SELECTED RG IS n

where n is the RG number of the lowest level repeating group common to all families in the report requested by the GENERATE command.

4.0 OUTPUT CONTROL

4.1 NCC BIN ASSIGNMENTS

In certain instances, it may be desirable to direct lengthy output to a high speed printer at NCC rather than tying up the low speed terminal being used. This can be accomplished by directing output to a user specified file which is then printed at NCC. The output from the run will be placed in the bin corresponding to the bin number in the @RUN statement and will consequently be mailed to the address associated with the respective bin where it can be picked up. This is the reason that a two digit bin number is a necessary part of the RUNID which is included in the @RUN statement. The bin number used should correspond to the location to which a user would like to have output mailed. For EPA personnel, it can be determined from Table 3, which provides the bin numbers and associated addresses of the EPA regional offices. Non-EPA users can contact Data Processing Support services at (919) 541-2385 for a bin assignment. As previously specified, the bin number is always included in the @RUN statement, whether lengthy output is anticipated or not.

4.2 DIRECTING OUTPUT TO NCC BINS FOR MAILING

The procedures for directing output to a NCC bin rather than the terminal being used is fairly simple and is an invaluable

TABLE 4. REGIONAL OFFICE BIN NUMBER ASSIGNMENTS

Region	Bin	Address	Phone
0	80	EPA Room 308A 26W - St. Claire Street Cincinnati, Ohio 45268	513/684-7780
1	81	EPA - Region 1 JFK Federal Building Room 2007 B Boston, Massachusetts 02203	617/223-5885
2	82	EPA - Region 2 26 Federal Plaza New York, New York 10007	212/264-9578 212/264-9850
3	83	EPA - Region 3 6th & Walnut Streets Philadelphia, Pennsylvania 19106	215/597-3530
4	84	EPA - Region 4 345 Courtland Street Atlanta, Georgia 30308	404/257-2864
5	85	EPA - Region 5 230 South Dearborn Avenue Chicago, Illinois 60604	312/353-2061 312/353-2303 312/353-2205
6	86	EPA - Region 6 1201 Elm Street First International Building Dallas, Texas 75270	214/729-2641
7	87	EPA - Region 7 324 East 11th Street Kansas City, Missouri 64106	816/758-4285
8	88	EPA - Region 8 1860 Lincoln Street Denver, Colorado 80203	303/327-2226
9	89	EPA - Region 9 215 Fremont Street San Francisco, California 94111	415/556-2326
10	90	EPA - Region 10 1200 Sixth Avenue Seattle, Washington 98101	206/399-1580

time saver when large jobs are to be run. The following procedure should be used, which assumes that the user is in the FGDIS when the decision is made to re-route the output of the next command.

1. While in the data base, type the following:

   ```
   EXIT:
   ```

   which will terminate use of the data base but continue the session on the Univac.

2. The normal response to the above command will be:

   ```
   DATE-----TIME-----END SYSTEM 2000 VERSION 2.80D
   ```

3. After receipt of the computer prompter (>) type:

   ```
   @ASG,UP [USER'S INITIALS].
   ```

   The [user's initials] are simply the two or three initials of the user followed by a period. The normal response to this will be:

   ```
   READY
   ```

4. After receipt of the computer prompter (>), re-initiate use of the data base by typing:

   ```
   @ADD FGDIS.RUN
   ```

   This will again put the user back in the FGDIS which will be signified by the normal execution messages.

5. After the data base prompter has been received, type the following:

   ```
   REPORT FILE IS [user's initials]:
   ```

   The [user's initials] must correspond to those used in step 3. This step directs all output to the alternate file.

6. Another data base prompter will be received, at which time the normal data base command can be entered. Remember that no output will come to the terminal but rather it will go to the specified file.

7. When generation of the output is complete, the data base prompter will again be printed. At this time type:

```
REPORT FILE IS OUTPUT:
```

This redirects output to the terminal being used.

8. Upon receipt of the next prompter, exit the data base by typing:

```
EXIT:
```

9. When the normal data base termination messages have been received and a prompter has printed, type:

```
@FREE [USER'S INITIALS].
```

Followed by (after receipt of the prompter:

```
@SYMΔ[USER'S INITIALS].,,PR1100
```

The [user's initials] must correspond exactly to those used in steps 3 and 5. This instructs the file to be printed at NCC with output being placed in the bin corresponding to the number that was used in the RUNID of the @RUN statement.

10. After the above command is executed, a prompter will again be received, at which time the user may log-off the computer using the normal log-off procedure (Section 3.1.2) or re-access the data base using the normal access command (Section 3.2).

The output generated using the above sequence of commands will be mailed to the address associated with the bin number used. If a special mail address is desired for a specific job, or assistance with a job that is to be printed at NCC is needed, Production Control should be notified at 919/541-3655 or FTS 629-3655.

APPENDIX A

REPORT WRITER PROGRAMS

The following documentation represents Report Writer programs that are available for use in conjunction with the FGDIS. A sample runstream is provided as a guide to the use of each program; however, Section 3.4 provides additional discussion. Also provided is a program abstract, sample output and suggested uses/comments. If assistance with a program is required, the person listed at the top of each sheet can be contacted. As new programs become available, this appendix will be updated.

DATA BASE PROGRAM DOCUMENTATION

1. PROGRAM NAME
TOTPRO

2. FILE NAME
FGDIS

3. DATA BASE NAME
FGDIS

4. LANGUAGE
REPORT WRITER

5. DATE WRITTEN
8/79

6. NAME/PHONE FOR ASSISTANCE
M. SMITH (PEDCo) 513-782-4700

7. PROGRAM ABSTRACT The purpose of the TOTPRO program is to generate a table similar in format to Section 6 of the EPA Utility FGD Survey. The generated output provides a breakdown of the various FGD processes with respect to system status. The processes are further broken down into the categories of saleable end product and throwaway end product with a final figure showing the percent of the total number of systems that produce a saleable end product.

8. SAMPLE RUNSTREAM The following commands are used within System 2000:

```
---
>@ADD FGDIS.TOTPRO
---
---
>GENERATE TOTPRO:
```

9. SAMPLE OUTPUT See attached (this output was generated with the above commands).

10. SUGGESTED USES/COMMENTS Note that any valid WHERE clause can be used in conjunction with the GENERATE statement to limit the data sets selected. For example, it would be possible to generate a process versus status listing for high sulfur coal FGD applications with the command:

```
GENERATE TOTPRO WHERE CO HAS C213 GT 2.5:
```

The table generated would then show only those processes that were either in use or planned for use at stations using coal with an average sulfur content of greater than 2.5 percent.

SUMMARY OF DOMESTIC FGD SYSTEMS BY PROCESS

	TOTAL		OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
AQUEOUS CARBONATE/SPRAY DRYING	1	100	0		1	100	0		0	
CITRATE	1	60	1	60	0		0		0	
LIME	1	65	0		1	65	0		0	
LIMESTONE	1	166	0		0		1	166	0	
LIME/LIMESTONE	1	475	0		0		1	475	0	
MAGNESIUM OXIDE	3	724	0		3	724	0		0	
WELLMAN LORD	8	2074	7	1540	1	534	0		0	
SUBTOTAL-SALEABLE PRODUCT	16		8	1600	6	1423	2	641	0	
DUAL ALKALI	5	2023	3	1181	0		2	842	0	
DUAL ALKALI/LIMESTONE	1	20	1	20	0		0		0	
LIME	36	17279	22	9093	3	1345	4	1841	7	5000
LIMESTONE	79	36520	33	11795	17	7637	17	9753	12	7335
LIMESTONE/ALKALINE FLYASH	2	1480	2	1480	0		0		0	
LIME/ALKALINE FLYASH	11	4013	9	2613	2	1400	0		0	
LIME/LIMESTONE	2	20	2	20	0		0		0	
LIME/SPRAY DRYING	9	2983	1	110	3	1060	5	1813	0	
PROCESS NOT SELECTED	12	6650	0		0		0		12	6650
SODIUM CARBONATE	9	3155	4	925	1	330	0		4	1900
SODIUM CARBONATE/SPRAY DRYING	1	440	0		1	440	0		0	
SUBTOTAL-THROWAWAY PRODUCT	167	74583	77	27237	27	12212	28	14249	35	20885
TOTAL	183	78247	85	28837	33	13635	30	14890	35	20885
SALEABLE % OF TOTAL MW		5		6		10		4		0

43 (25295 MW) UNITS LISTED AS "UNDECIDED" WERE NOT INCLUDED IN THESE TABULATIONS
THESE MEGAWATT RATINGS ARE EQUIVALENT SCRUBBED.

DATA BASE PROGRAM DOCUMENTATION

1. PROGRAM NAME TOTMW	**2. FILE NAME** FGDIS
3. DATA BASE NAME FGDIS	**4. LANGUAGE** REPORT WRITER
5. DATE WRITTEN 8/79	**6. NAME/PHONE FOR ASSISTANCE** M. SMITH (PEDCo) 513-782-4700

7. PROGRAM ABSTRACT The purpose of the TOTMW program is to generate a table similar to Table 1 of the Executive Summary in the EPA Utility FGD Survey. It provides a breakdown of the various FGD systems in the data base with respect to status. Included for each status is a total number of systems and a total MW value, in terms of both Total Controlled Capacity and Equivalent Scrubbed Capacity (for definitions of these refer to the EPA Utility FGD Survey).

8. SAMPLE RUNSTREAM The following commands are used within System 2000:

```
---
>@ADD FGDIS.TOTMW
---
---
>GENERATE TOTMW:
```

9. SAMPLE OUTPUT See attached (this output was generated using the above commands).

10. SUGGESTED USES/COMMENTS A valid WHERE clause can be used in conjunction with the GENERATE statement to limit the units included in the table, although one is not necessary if a complete table inclusive of all units is desired. As an example, if a table illustrating the status of units utilizing limestone as the reagent was desired the command would be:

```
GENERATE TOTMW WHERE C303 EQ LIMESTONE:
```

NUMBER AND TOTAL MW OF FGD SYSTEMS AND PARTICLE SCRUBBERS

STATUS	UNITS	TCC-MW	ESC-MW
OPERATIONAL	85	31767	28837
UNDER CONSTRUCTION	33	14238	13635
PLANNING			
CONTRACT AWARDED	30	14903	14890
LETTER OF INTENT	10	7515	7515
REQUESTING-EVALUATING BIDS	18	10151	10035
CONSIDERING ONLY	50	30078	28630
SUBTOTAL	226	108652	103542
PARTICLE SCRUBBERS	15	2998	2752
SUBTOTAL-DOMESTIC	241	111650	106294
JAPANESE FGD	7	1805	1805
TOTAL	248	113455	108099

DATA BASE PROGRAM DOCUMENTATION

1. PROGRAM NAME COLIST

2. FILE NAME FGDIS

3. DATA BASE NAME FGDIS

4. LANGUAGE REPORT WRITER

5. DATE WRITTEN 8/79

6. NAME/PHONE FOR ASSISTANCE M. SMITH (PEDCo) 513-782-4700

7. PROGRAM ABSTRACT The purpose of the COLIST program is to generate a table similar to Section 1 of the EPA utility FGD Survey. Included is company name, unit name, and number, unit location, initial start-up date, status, and regulatory class. These are listed alphabetically by company and unit.

8. SAMPLE RUNSTREAM The following commands are used within System 2000:

```
---
>@ADD FGDIS.COLIST
---
---
>GENERATE COLIST:
```

9. SAMPLE OUTPUT The following output was generated by the above commands:

```
DATE:09/27/79

COMPANY
     UNIT NAME                       NO.        UNIT LOCATION                             START          REG.
                                                                                          DATE   STATUS  CLASS
-----------------------------------------------------------------------------------------------------------------


ALABAMA ELECTRIC COOP
     TOMBIGBEE                       2        LEROY          ALABAMA                      7809     1      A
     TOMBIGBEE                       3        LEROY          ALABAMA                      7906     1      A
ALLEGHENY POWER SYSTEM
     MITCHELL                        33       COURTNEY       PENNSYLVANIA                 8208     6      B
     PLEASANTS                       1        BELMONT        WEST VIRGINIA                7903     1      A
     PLEASANTS                       2        BELMONT        WEST VIRGINIA                8009     2      A
```

10. SUGGESTED USES/COMMENTS Note that any valid WHERE clause can be used in conjunction with the GENERATE clause to specify the units that will be included in the list. For example, an alphabetical listing of high sulfur coal FGD applications could be obtained using the following:

```
GENERATE COLIST WHERE CO HAS C213 GT 2.5:
```

As a second example, an alphabetic listing of all operational systems could be obtained with the following:

```
GENERATE COLIST WHERE C312 EQ 1:
```

DATA BASE PROGRAM DOCUMENTATION

1. PROGRAM NAME PERAVG	**2. FILE NAME** FGDIS
3. DATA BASE NAME FGDIS	**4. LANGUAGE** REPORT WRITER
5. DATE WRITTEN 8/78	**6. NAME/PHONE FOR ASSISTANCE** M. SMITH (PEDCo) 513-782-4877

7. PROGRAM ABSTRACT The PERAVG program was designed to provide the user with a performance history of any unit(s) in question. It generates a table that displays four dependability parameters (availability, reliability, operability, utilization) as well as boiler hours, FGD system operating hours, and period hours for the time period and unit(s) specified. Also included is the average value of each of the dependability parameters for the specified time period.

8. SAMPLE RUNSTREAM The following commands are used within System 2000:

```
@ADD FGDIS.PERAVG
---
---
>GENERATE PERAVG WHERE C1 EQ 72 AND C3401 GT 7900:
 -399- SELECTED RG IS 3440
```

9. SAMPLE OUTPUT The following output was generated by the above commands:

```
                          NEVADA POWER                          NET GENERATING CAPACITY WITH FGD = 110
                          REID GARDNER                          GROSS GENERATING CAPACITY = 125
                          1                                     I SCRUBBED = 100

        DATE   AVERAGED   PERIOD   BOILER   FGD
               THROUGH    HOURS    HOURS    HOURS  AVAILABILITY   OPERABILITY   RELIABILITY   UTILIZATION
        ----   --------   ------   ------   -----  ------------   -----------   -----------   -----------
        7901               744      681      502       83.9           73.7          73.7          67.0
        7902               672      670      575       85.6           85.9          85.9          85.6
        7903               744      603      582       97.9           96.5          96.5          78.3
        7904               720      188      185      100.0           98.7          98.6          25.7
        7905               744      275      204       99.8           74.4          74.4          27.5
        7906               720      641      610       97.7           95.1          95.2          84.7
 AVERAGE                                               -----          -----         -----         -----
                                                       94.1           87.4          87.4          61.5

 NOTE:  *'S INDICATE THAT THE VALUE DOES NOT EXIST.
```

10. SUGGESTED USES/COMMENTS It should be noted that a where clause must be used in conjunction with the generate statement which specifies the unit(s) and time period desired. Otherwise the program will utilize all performance data available resulting in large amounts of output. As an example, if the performance history of low sulfur coal FGD applications was desired for the year 1978 the command would be:

GENERATE PERAVG WHERE CO HAS C213 LT 2.5 and C3401 EQ 7800*7812:

DATA BASE PROGRAM DOCUMENTATION

1. PROGRAM NAME ABSTCT	**2. FILE NAME** FGDIS
3. DATA BASE NAME FGDIS	**4. LANGUAGE** REPORTER WRITER
5. DATE WRITTEN 8/79	**6. NAME/PHONE FOR ASSISTANCE** M. SMITH (PEDCo) 513-782-4700

7. PROGRAM ABSTRACT The ABSTCT program is designed to provide the user with a short paragraph presenting a general overview of the unit(s) specified. Included in the paragraph is data such as unit MW ratings, unit location, boiler and FGD system type, FGD process utilized, etc. (The paragraph is identical to that in Section 2 of the EPA Utility FGD Survey).

8. SAMPLE RUNSTREAM The following commands are used within System 2000:

```
---
>@ADD FGDIS.ABSTCT
---
---
>GENERATE ABSTCT WHERE C1 EQ 157:
 -399- SELECTED RG IS 3200
```

9. SAMPLE OUTPUT The following output was generated with the above commands:

```
   BIG RIVERS ELECTRIC                            MW-GROSS; 242
   GREEN                                          MW-NET WITH FGD; 200
   2                                              MW-ESC; 242

 THE EMISSION CONTROL SYSTEM FOR THIS NEW COAL-FIRED UNIT IS BEING
 SUPPLIED BY AMERICAN AIR FILTER.  THE SYSTEM WILL CONSIST OF A COLD SIDE
 ESP AND TWO SPRAY TOWERS CONTROLLING PARTICULATE AND SO2 TO 99.6 PERCENT
 AND 90 PERCENT, RESPECTIVELY. THE B&W BOILER WILL FIRE HIGH SULFUR (3.5
 4.5 PERCENT) WESTERN KENTUCKY COAL. THE FGD SYSTEM WILL INCLUDE AN
 INDIRECT HOT AIR REHEAT SYSTEM. IUCS WILL CONSTRUCT A SLUDGE DISPOSAL
 SYSTEM TO SERVICE BOTH GREEN 1 AND 2. THE BOILER IS CURRENTLY 8% COMPLETE
 AND CONSTRUCTION HAS JUST BEGUN ON THE FGD SYSTEM.
---
>
```

10. SUGGESTED USES/COMMENTS This program is helpful when a general description of FGD operations at a unit is desired in paragraph form. Any valid WHERE clause can be used in conjunction with the GENERATE statement to limit the number or type of systems that will appear in the output. For example, a brief description in paragraph form could be provided for all retrofit systems by using the following command:

```
GENERATE ABSTCT WHERE CO HAS C309 EO RETROFIT:
```

DATA BASE PROGRAM DOCUMENTATION

1. PROGRAM NAME IDS

2. FILE NAME FGDIS

3. DATA BASE NAME FGDIS

4. LANGUAGE Report Writer

5. DATE WRITTEN 11/79

6. NAME/PHONE FOR ASSISTANCE N. Gregory (PEDCo) 513-782-4700

7. PROGRAM ABSTRACT The IDS program was designed to generate a list displaying the identification numbers for each of the units in the FGD INFORMATION SYSTEM. Included is company name, unit name, unit number, and identification number. These are listed alphabetically by company name and unit.

8. SAMPLE RUNSTREAM The following commands are within System 2000:

```
>@ADD FGDIS.IDS
---
---
>GENERATE IDS:
```

9. SAMPLE OUTPUT The following output was generated by the above commands:

```
              DATE:11/08/79

   ID          COMPANY NAME                          UNIT NAME            UNIT NUMBER
-------------------------------------------------------------------------------------

    1   ALABAMA ELECTRIC COOP                      TOMBIGBEE                  2
    2   ALABAMA ELECTRIC COOP                      TOMBIGBEE                  3
  190   ALLEGHENY POWER SYSTEM                     MITCHELL                   33
    3   ALLEGHENY POWER SYSTEM                     PLEASANTS                  1
    4   ALLEGHENY POWER SYSTEM                     PLEASANTS                  2
    5   ARIZONA ELECTRIC POWER COOP                APACHE                     2
    6   ARIZONA ELECTRIC POWER COOP                APACHE                     3
    7   ARIZONA PUBLIC SERVICE                     CHOLLA                     1
    8   ARIZONA PUBLIC SERVICE                     CHOLLA                     2
  152   ARIZONA PUBLIC SERVICE                     CHOLLA                     4
  112   ARIZONA PUBLIC SERVICE                     FOUR CORNERS               1
```

10. SUGGESTED USES/COMMENTS Note that a valid WHERE clause can be used to single out specific units.
Example:

```
GENERATE IDS WHERE C312 EQ 1:
```

This command would print only the operational systems.

DATA BASE PROGRAM DOCUMENTATION

1. PROGRAM NAME	FNOTES	2. FILE NAME	FGDIS
DATA BASE NAME	FGDIS	4. LANGUAGE	REPORT WRITER
5. DATE WRITTEN	2/80	6. NAME/PHONE FOR ASSISTANCE	M. SMITH (PEDCo) 513-782-4700

7. PROGRAM ABSTRACT

The FNOTES program was designed to provide the user with a listing of the footnotes contained in the data base for the unit(s) and element(s) in question. Along with the footnotes, the output provides the element number to which the footnote pertains.

8. SAMPLE RUNSTREAM

The following commands are used within System 2000:

```
>@ADD FGDIS.FNOTES
---
---
>GENERATE FNOTES WHERE C1 EQ 7:
```

9. SAMPLE OUTPUT

The following output was generated with the above commands:

```
    ARIZONA PUBLIC SERVICE                         MW-GROSS;  119
    CHOLLA                                         MW-NET WITH FGD;  115
    1                                              MW-ESC:  119

FOOTNOTE     ELEMENT
NUMBER       NUMBER                                     FOOTNOTE
--------     -------                                    --------

    1          3104     FLOODED DISC SCRUBBER ACTS AS AN ANNULAR-THROAT VENTURI.

    2           902     DOUBLE LOOP COMBINATION TOWER WITH SPRAY TOWER LOWER STAGE AND "WETTED
                        FILM CONTACTOR" GRID TYPE UPPER STAGE (RESEARCH-COTTRELL DESIGN).

    3           912     NOT APPLICABLE
```

10. SUGGESTED USES/COMMENTS

This program enables the user to access any footnotes that might exist for a specified unit or field. A valid WHERE clause can be used in conjunction with the GENERATE statement to limit the selected units and fields if desired. As an example, if the footnotes for the ABSORBER TYPE field for units utilizing a limestone process were desired the command would be:

```
GENERATE FNOTES WHERE CO HAS C303 EQ LIMESTONE AND C3205 EQ 902:
```

APPENDIX B

TYMNET DIAGNOSTIC MESSAGES

ALL PORTS BUSY or HOST OUT OF PORTS

No connection can be made with the host computer at this time because all host ports available to TYMNET are busy. Hang up and log in again in a few minutes.

CIRCUITS BUSY

All available paths to the TYMCOM are busy; hang up and log in in a few minutes.

DROPPED BY HOST SYSTEM

You have logged off and/or have been disconnected by the host computer. If the session is finished, hang up; if not, log in again.

HOST DOWN

The network is fully operational, but the host computer is down. Hang up and log in again in a few minutes.

HOST NOT AVAILABLE THRU NET

This message can appear if: 1) the TYMCOM, its neighbor(s), or a line between them is down, or 2) an invalid host has been requested, or 3) a new Supervisor is taking over the network and has not yet picked up the host. For 1) and 3), hang up and log in in about 10 minutes. A 2) error may be the result of a mistyping.

HOST NOT RESPONDING

Either the link between the TYMCOM and the host is temporarily lost or proper host response to a connect request is not being received. Try again in a few minutes.

HOST SHUT

The Supervisor is not routing new users to the host; current users are not affected. Hang up and log in again in a few minutes.

NO PATH AVAILABLE...DISCONNECTING or LOGON ABORTED...DISCONNECTING

The network is unable to process new log ins at this point; hang up and try again in five minutes.

PLS SEE YOUR REP.

A valid user name or password has not been entered within two minutes after the terminal-identifier entry. Hang up and try again.

PLEASE TRY AGAIN

An attempt has been made to log into a multihost system with an incorrect user name. Log in again with a correct user name.

TRY AGAIN IN 2 MIN

A new Supervisor is taking over the network, or a link has failed; hang up and log in again in a few minutes.

RING NO ANSWER ON PORT X

No connection can be made with the UNIVAC system at this time because the UNIVAC computer is not responding. Try again in a few minutes (the host may be down).

APPENDIX C

SYSTEM 2000 DIAGNOSTIC MESSAGES

SYSTEM 2000 contains a large set of user diagnostics. The diagnostics are generally of two types -- error and informative messages. They are designed to keep the user apprised of system reaction to his actions. This appendix contains many of the SYSTEM 2000 user diagnostics listed alphabetically. If the diagnostic message does not appear sufficiently clear by itself, a descriptive paragraph is added.

If a SYSTEM ERROR CODE ...<xxx> is issued, it is the result of a malfunction in the system and not of the user's command. System errors are coded with numbers that are meaningful to programmers maintaining SYSTEM 2000. All system errors are fatal to the rest of the job and may damage the data base. All occurrences of system errors should be immediately reported to PEDCo technical support personnel.

Each diagnostic message may or may not be preceded by a hyphen (-) or a string of hyphens, or a 3-digit number with hyphens. Diagnostic messages which begin with a variable, indicated here by the symbols <xxx>, are listed alphabetically, as if the <xxx> were not present.

An example of the printout when an error occurs is shown below. It is based on the FGDIS definition; components C5 and C107 are in different data sets.

```
PRINT C5,PRINT C107 WHERE C201 EQ COAL:
................C
SYNTAX ERROR IN COMMAND
```

The "C" (representing Command File) occurs immediately below the point of error.

A

230 - ALL OPERATIONS MUST ACT ON THE SAME DATA SET -

Two different RG's or elements with different parent RG's were used in an action clause in a command.

865 - ATTEMPTED WRITE IGNORED

User has attached the data base with SHARED DATA BASE command, which disallows any data base modifications. This message is printed at the end of the job if user has performed any command which would write into the identification portion of the data base (e.g., SEPARATOR IS command). The write is not performed and the data base will not be modified.

B

218 - BAD DATA VALUE

Processing data value in a WHERE clause during a command sequence. The data value exceeded the maximum number of characters allowed.

<ddd> <ttt> BEGIN SYSTEM 2000 RELEASE <n.nn>

This informative message is printed at the start of each SYSTEM 2000 job.

C

322 - CLAUSE CONTAINS NON-DESCENDANTS OF CONTROLLING RG

The <minor item list> following a BY <by RG> may contain only descendants of the <by RG>.

506 - COMMAND INVALID IF NO DATA BASE ATTACHED
815 - COMMAND INVALID IF NO DATA BASE ATTACHED

Command is meaningless until a data base is attached.

864 - COMMAND NOT AVAILABLE IN SHARED MODE

User has attached the data base with SHARED DATA BASE command, which disallows any data base modification. This message is printed if user attempts to do any of the following:

1. Enter the Define Module
2. Perform a queued access update
3. Perform an immediate access update

219 - COMMAND TOO LONG

Command contains more than the maximum allowable number of operations, qualifiers, and/or component references.

D

860 - DATA BASE NOT LOCKED

User of a shared data base has attempted to modify the data base with an update command.

DATA SET HAS NO PARENT
204 - DATA SET HAS NO PARENT

The hierarch of RG's in a value string must be maintained. This request is not processed.

E

ELEMENT DOES NOT BELONG TO PREVIOUS RG
205 - ELEMENT DOES NOT BELONG TO PREVIOUS RG

Element in value string belongs to a parent repeating group other than the previous RG in the value string. The cause of error may be a missing RG, an erroneous RG number, elements for one data set were scattered inadvertantly, or the element number was erroneous.

ELEMENT EVALUATED TWICE IN ONE DATA SET

In the value string two values were assigned to one element in a single data set. Cause of error may be a missing RG number, an erroneous element number, or two actual values incorrectly assigned to the same element.

329 - ELEMENT IDENTIFIER REQUIRED

A RG identifier was used where an element identifier was required.

214 - ELEMENT IN WHERE-CLAUSE NOT OF SAME FAMILY AS REST

Elements in WHERE clause are from disjoint data sets.

227 - ELEMENT VALUED TWICE IN SAME DATA SET

In a structured value string two values were assigned to one element in a single data set. Cause of error may be:

- A missing RG number
- An erroneous element number
- A missing entry terminator at the end of a logical entry on the Data File
- Two values incorrectly assigned to the same element

<ttt> END SYSTEM 2000

Informative message printed at the end of a SYSTEM 2000 job that terminates normally.

<ttt> = the current time

861 - ERROR IN ASSIGN/FREE OF SPECIAL IO FILE

Error in attempting to attach a special file (Command, Data, Message, or Report File). May be improper file type or file may already be in use.

EXEC8 ERROR: TYPE 00 CODE <xxx> AT PROG ADD <yyy>
-SYSTEM ERROR ... CODE 816

<yyy> is the core location that caused the error

<xxx> indicates the reason for the error; if equal to:

00 - illegal operation code

01 - guard mode (address field out of range)

02 - divide overflow or underflow

See the Introduction to the Diagnostic Message section for procedure to follow when a system error occurs.

324 - EXPRESSION LEVEL BELOW LEVEL OF OBJECT COMPONENT

A compute function may not contain components whose level is below that of the object component.

325 - EXPRESSION TYPE NOT COMPATIBLE WITH OBJECT TYPE

A compute function may not contain type DATE or numeric elements when the object element is type NAME or TEXT.

F

F OR D SPECIFICATION IS OUT OF LEGAL RANGE

The F or D specification in the title field of a LIST command must contain an integer between 1 and the maximum number of columns permissible for the output device being used. The user has specified something outside the legal range. The command is rejected.

FATAL ERROR TRAPPED. <nnn>
<optional message>

The SYSTEM 2000 job has been terminated, due to operator drop or time limit exceeded, or some other reason. The optional message or the dayfile may supply the reason for job termination.

FATAL OPERATING SYSTEM I/O ERROR

For reasons beyond the control of either the user or of SYSTEM 2000, a fatal input/output error has been detected.

814 - FILE NAME MUST BE 1 TO 6 CHARS. LONG

File change command specified a file name that was either too long, not punched on the card, or contained a special character.

FIRST COMPONENT OCCURS AFTER SECOND
312 - FIRST COMPONENT OCCURS AFTER SECOND

DESCRIBE C_m THROUGH C_n: command requires that component C_m precede component C_n in the data base definition structure.

H

220 - HAS CONTAINS NON-DESCENDANT OF PARENT RG

The condition following a HAS may contain only components that are descendants of the RG preceding the HAS.

HEADER AND/OR FOOTING SPECIFICATION MUST APPEAR FIRST

The F and D specifications in the title of a LIST command must precede any other title specifications if they are to be used at all. The user has allowed an F or D to follow one of the other title specifications.

I

ILLEGAL USE OF REPEATING GROUP
319 - ILLEGAL USE OF REPEATING GROUP

a) An RG cannot precede EXISTS, FAILS, GE, GT, LE, LT, EQ, NE in a WHERE clause.

b) An RG cannot be used with MAX or MIN.

c) An RG cannot be used with LIST.

d) An RG cannot be used in a function.

L

323 - LIST FORMAT SPECIFIES INSUFFICIENT NUMBER OF FIELDS

LIST format specification list contains fewer fields than the object list.

M

MDUP=0 ON NO CHG <xxx>
MDUP=1 ON LOCO CHG <xxx>
MDUP=1 ON VALU CHG <xxx>
3,8 MDUP=0 ON NO CHG: <xxx>
3,8 MDUP=1 ON LOCO CHG: <xxx>
3,8 MDUP=1 ON VALU CHG: <xxx>

Any of the above messages occur as a result of a malfunction in the system and are not caused by an error in the user's commands. The messages and their contents are meaningful to PEDCo support personnel and should be reported immediately to them, along with a description of the job in which the malfunction occurred.

MIS-ORDER ON LOCO <xxx>
MIS-ORDER ON VALU <xxx>
3,8 MIS-ORDER ON LOCO: <xxx>
3,8 MIS-ORDER ON VALU: <xxx>

Any of the above messages occur as a result of a malfunction in the system and are not caused by an error in the user's commands. The messages and their contents are meaningful to PEDCo technical support personnel and should be reported immediately to them, along with a description of the job in which the malfunction occurred.

N

NO OVERLAY DIRECTORY

This is a result of a system malfunction and does not involve the user command. It is fatal to the rest of the job and may damage the data base. All system malfunctions should be reported immediately to SYSTEM 2000 technical support personnel.

NO PRIOR LEGAL COMMAND
302 - NO PRIOR LEGAL COMMAND

DITTO may only be used if preceded by a valid command.

NO PRIOR LEGAL WHERE CLAUSE

WHERE SAME may only be used if preceded by a valid command with a WHERE clause.

O

320 - ORDERING ILLEGAL WITH SUM,COUNT,ETC

Ordering is not meaningful when only summaries are to be printed.

314 - ORDERING KEY TRUNCATED AT LEAST ONCE

The retrieved output may not be sorted properly on the least significant keys.

P

POS INTEGER REQ

A negative number or a non-numeric character is used where a positive integer is required.

316 - PRINT CLAUSE TOO COMPLEX

a) More than maximum allowable number of components specified in a PRINT-clause.

b) Too many distinct constants referenced in functions.

c) Too many syntactic units included in functions.

R

REDEFINITION OF HEADER OR FOOTING

D or F specification has been used twice in the TITLE field of a LIST command.

REPEATING GROUP MUST PRECEDE 'HAS'

In the WHERE clause, HAS takes a repeating group component or ENTRY operand.

S

SYSTEM ERROR ... CODE <xxx>
SYSTEM ERROR ... CODE ERR <xx>

A system error message is the result of a malfunction in the system and not of the user's command. System errors are coded with numbers that are meaningful to programmers maintaining SYSTEM 2000. All system errors are fatal to the rest of the job and may damage the data base. All occurrences of system errors should be immediately reported to PEDCo technical support personnel, with pertinent information saved, such as listings, card decks, and the damaged data base.

SYSTEM RELEASE NUMBER <www>
DATA BASE NAME IS <xxx>
DEFINITION NUMBER <yyy>
DATA BASE CYCLE <zzz>

These four lines constitute the heading for the display when a full DESCRIBE command is issued.

T

TOO MANY COLUMNS SPECIFIED IN FORMAT

Exceeded the limit of 136 print columns in the title of a LIST command.

216 - TOO MANY CONDITIONS OR SUBEXPRESSIONS

Maximum of seven (7) conditions within a subexpression, or subexpressions within an expression.

TOO MANY LINES SPECIFIED IN TITLE

Exceeded the limit of 3 lines in the title of a LIST command.

TOO MANY OPERANDS FOR OPERATOR

Operator in WHERE clause followed by more operands than appropriate, e.g., ... WHERE C1 GE 1.0*2.0: The GE, GT, LT, LE, operators must have one operand. FAILS and EXISTS do not have any operand. SPANS, EQ, and NE may take two operands separated by a system separator.

TOO MANY OPERANDS IN WHERE CLAUSE

Exceeded system limitation for a WHERE clause. Request should be broken up into several requests using SAME AND or SAME OR to obtain the same results.

TOO MANY OPERATORS IN WHERE CLAUSE

Exceeded system limitation for the number of operators (e.g., EQ, NOT,) in a single WHERE clause. Up to 58 operators are allowed.

TYPE OF WHERE CLAUSE DIFFERS FROM LAST USE

When using DITTO:

1. Previous request must have WHERE clause if DITTO uses WHERE.
2. Previous request must have AFTER or BEFORE clause to use DITTO with AFTER or BEFORE.

U

UNBALANCED PARENTHESES

WHERE clause cannot be evaluated due to unbalanced left and right parentheses.

808 - UNRECOGNIZED <COMP ID>

The component identification used is either not defined for the data base, or is defined as an inappropriate type for its use within the command.

810 - WARNING: DATA BASE DAMAGED. NO UPDATES PERMITTED

The data base just attached has been damaged during a previous usage of SYSTEM 2000. No further modifications to the data base or its definition will be permitted. Any time the user discovers his data base is damaged, he should notify PEDCo technical support personnel for corrective action.

WHERE CLAUSE ILLEGAL WHEN UNRELATED ITEMS ARE IN PRINT LIST

If a WHERE clause is used in a PRINT or LIST command, all of the components referenced to the left of WHERE must be in the same family in the definition hierarchy. A BY clause can be used to print unrelated items.

WHERE CLAUSE REQUIRED WITH ORDERING

Ordering takes place on the selected data sets produced by the WHERE clause, which must be present.